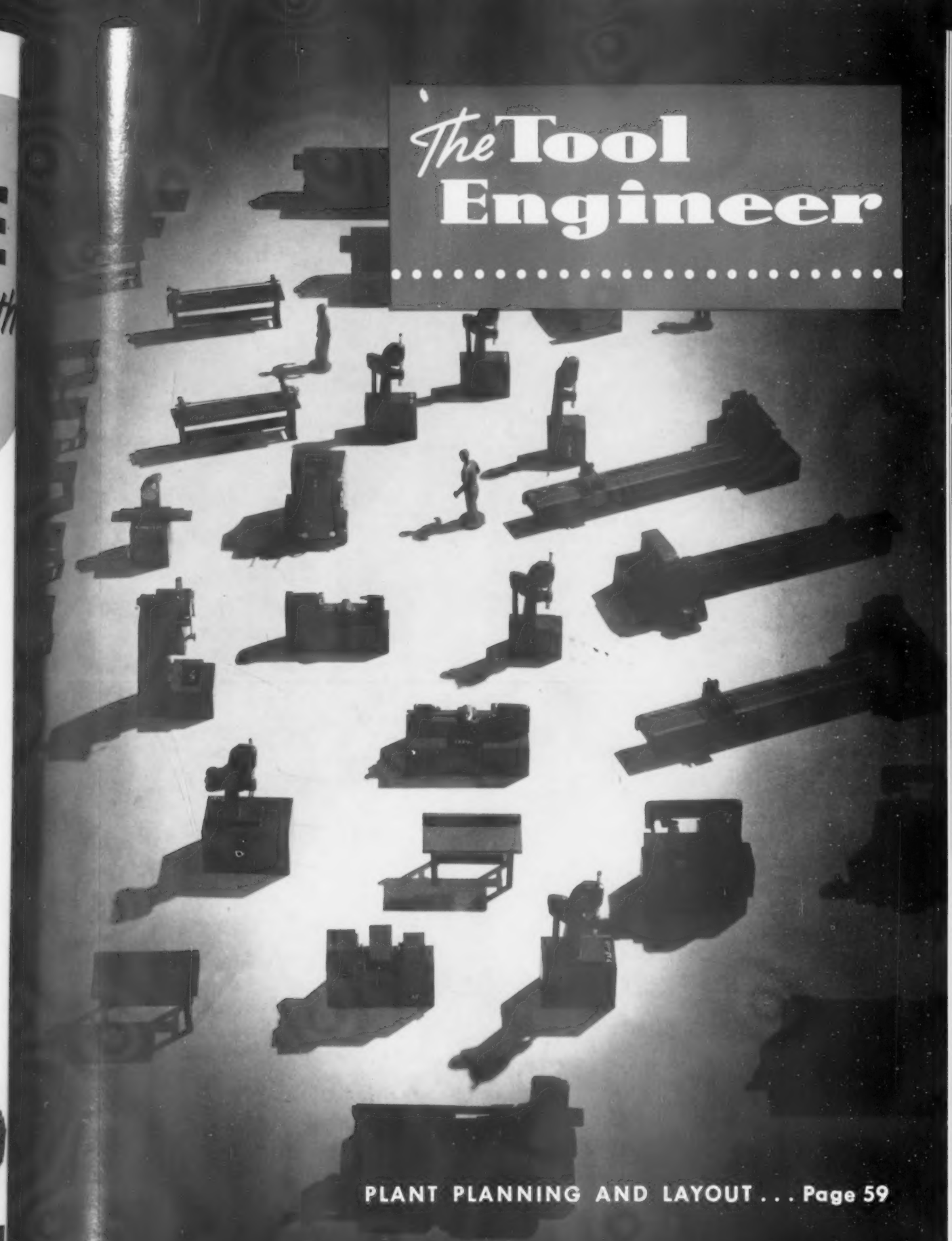
The Tool Engineer



PLANT PLANNING AND LAYOUT . . . Page 59

PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS

NOVEMBER, 1951
VOLUME XXVII, NO. 5

PLANNING ENGINEERING CONTROL OF TOOLING EQUIPMENT PRODUCTION

MACHINE TOOLS

Jig Borers
Precision Rotary Tables
Vertical Shapers
Toolroom Lathes
Automatic Lathes
Automatic Centering Machines
Thread Millers
Vertical Millers and Profilers
Die Sinkers
Automatic Duplicating Machines
Keller Tracer-Controlled Milling Machines
Cutter and Radius Grinders
Vertical Surface Grinders
Vertical Die and Surface Grinders
Gear Grinders
Deep Hole Drillers
Kellerflex Flexible Shaft Machines
Diaform Wheel Forming Attachment

CUTTING TOOLS

Taps (all types)
Dies (all types)
Screw Plates
Milling Cutters
Metal Slitting Saws
Multiple Thread Milling Cutters
Form Cutters
End Mills
Profiling Cutters
Die Sinking Cutters
Keller Cutters and Tracers
Twist Drills
Deep Hole Drills
Reamers (all types)
Counterbores
Cut-Off Blades
Thread Rolling Dies
Solid Carbide and Carbide Tipped Tools
Kellerflex Burs (Steel and Carbide)

AND GAGES

Cylindrical Plugs and Rings (Steel and Carbide)
Thread Plugs and Rings (Steel and Carbide)
Pipe Thread Gages (Plugs and Rings)
Snap Gages (AGD Adjustable Limit)
Snap Gages (Roll Thread)
A.P.I. (Oil Country) Gages
A.A.R. (Railroad) Gages
Precision End Measures
Hoke and USA Precision Gage Blocks (Steel and Carbide)
Universal Internal Comparators
Supermicrometers
Standard Measuring Machines
Electro-Mechanical Lead Testers
Electrolimit Comparators
Air-O-Limit Comparators
Tri-Roll Thread Comparators
Continuous (Mill) Gages
Multiple Station Gages
Special Gages

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Me...and Pratt & Whitney

—WHAT A TEAM

I'm an experienced machinist... exacting... versatile... fast. Above all, I'm accurate... as long as I have good tools to work with, precision tools like those made by Pratt & Whitney. When the two of us get together, brother, we're an unbeatable team.

Skilled men, working with precision tools, will turn out better work — faster.

PRATT & WHITNEY

Division NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U.S.A.

Dedicated to Accuracy for 91 years

VOLUME XXVII
NUMBER 5
NOVEMBER, 1951

The Tool Engineer

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GADGETS

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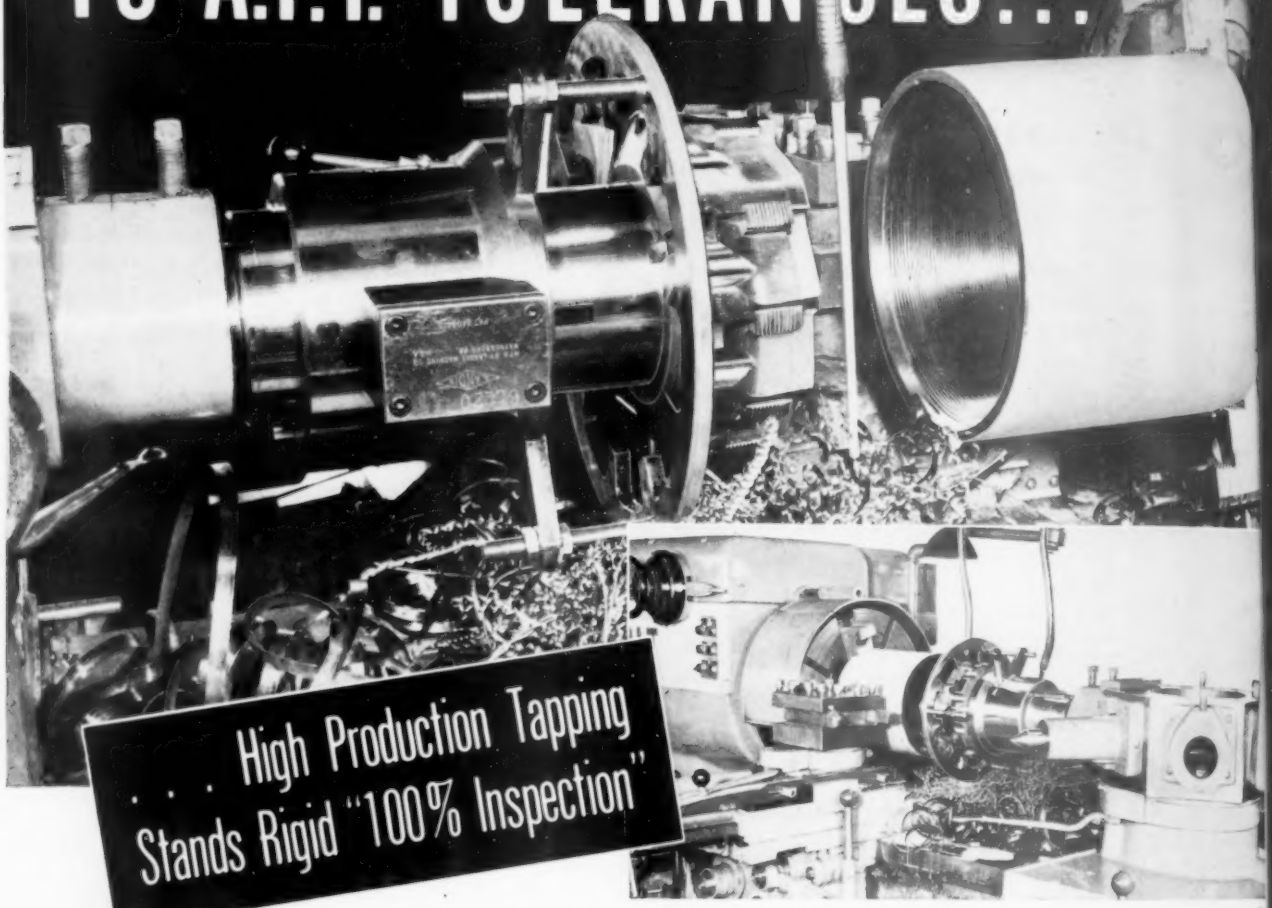
AMERICAN SOCIETY OF TOOL ENGINEERS

THE TOOL ENGINEER is published monthly in the interest of the members of the American Society of Tool Engineers. Entered as second-class matter, November 4, 1947, at the post office at Milwaukee, Wisconsin, under the Act of March 3.

OFFICE OF PUBLICATION: 239 E. Chicago St., Milwaukee, Wis.
EXECUTIVE AND EDITORIAL OFFICES: 10700 Puritan Ave., Detroit 21, Michigan.

INTERNAL THREADS TAPPED TO A.P.I. TOLERANCES...



. . . High Production Tapping Stands Rigid "100% Inspection"

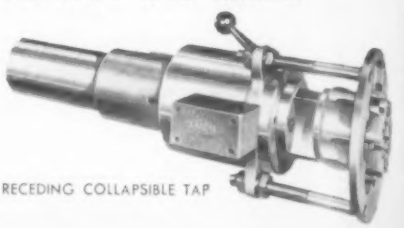
Casing couplings are subjected to enormous strains created by the weight of the suspended casing, as well as to tremendous internal and external pressures. For these reasons they require threads of extreme accuracy. Thus the prime consideration in the selection of equipment for the production of these threads is that it produce A.P.I. threads at economical production rates.

The operation shown here is one of many where internal tapered threads are cut to A.P.I. tolerances at high production rates by Landis LL Receding Collapsible Taps. 8 pitch round form threads are cut in Grade N80 casing couplings 10¾" in diameter to a length of 4" with a ¾" taper. Production is high—averaging consistently about 17 surface feet per minute. A.P.I. tolerances are met without difficulty.

Landis LL Receding Collapsible Taps are designed and built for this type of work. The receding mechanism causes the chasers to recede into the tap head automatically at a rate equal to the taper of the thread being cut. When the thread is completed the chasers collapse into the tap head, and the tap is withdrawn.

Each tap has a wide range of cutting diameters since the tap heads are detachable and interchangeable. For example, if furnished with appropriate heads, the 6LL Tap Body, shown here equipped with a 10" ALM Tap Head will cut threads in all pipe sizes ranging from 6" to 12" inclusive. The Style LL Tap Body is made in four sizes to cover a range of nominal pipe sizes from 1" to 12" inclusive.

Write for Bulletin G-95



LANDIS STYLE LL RECEDING COLLAPSIBLE TAP

LANDIS *Machine* COMPANY · WAYNESBORO PENNSYLVANIA

HARDINGE
ELMIRA, N.Y.

Style "S" Master Collets

The only Master where there is no work pressure on the screw.

and Low Cost Pads

FOR QUALITY PERFORMANCE

Only HARDINGE Master Collets and Pads have this independent double dovetail clamp which anchors the pad in place . . . . . no threaded holes in Master Collets or Pads.

Write for Bulletin "S"

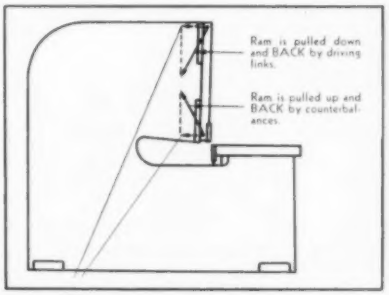
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Write for New Cincinnati Shear Catalog S-6a

Keep up to date on Shearing!

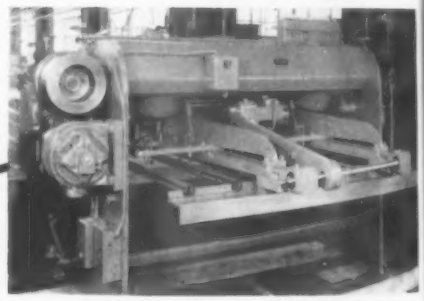
Learn about... the exclusive features illustrated below—and many others.



Cincinnati Non-Float Ram

Cincinnati Sure-Set Knife Aligner

Cincinnati Hydraulic Holddowns



Cincinnati Magnetic Sheet Support

Just off the press This up-to-the-minute, illustrated catalog will give you a complete description of the speedy, accurate All-Steel Cincinnati Shears in capacities from 12 gauge to 1¼-inch steel plate, in 4-foot to 24-foot lengths. Also, many special features for particular needs are illustrated and described.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

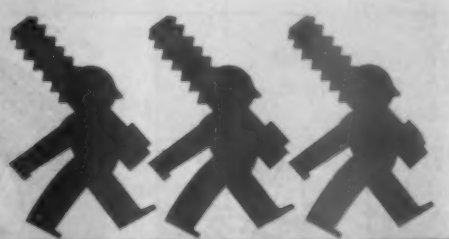
QUALITIES OF CRAFTSMANSHIP IN WINTER CHIP DRIVER TAPS

Precision Chip Driver Contours

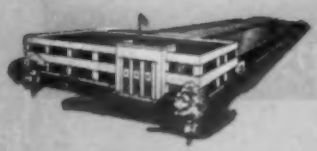
Close size control of tapped holes can only be maintained when chip driver contours are held to precision limits. The chip driver contours on Winter Taps are accurate and uniform for free cutting action and high production. Other factors contributing to the superiority of Winter "Balanced Action" Taps are exact flute spacing, uniform flute contours, and accurate and concentric chamfers. The Winter line of threading tools also includes hand, machine screw, pulley, pipe, nut, and tapper taps, and a full complement of dies.

ALWAYS AT YOUR SERVICE

YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the telephone on your desk.



WINTER



WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company, Rochester, Michigan, U. S. A. Distributors in Principal Cities • Branches in New York, Detroit, Chicago, San Francisco

NATIONAL SHEARING ACTION HELEX END MILLS

SMOOTH, EFFICIENT OPERATION at high speeds and feeds is yours when you use National "Shearing Action" Helex End Mills. The high helix angle of their cutting edges and their general free cutting action assure better work and long tool life. Helex End Mills are part of National's complete line of rotary metal cutting tools, which also includes twist drills, reamers, milling cutters, counterbores, hobs, and special tools. They are stocked by our distributors near you, and at factory branches in New York, Detroit, Cleveland, and San Francisco.

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Rochester, Michigan, U.S.A.

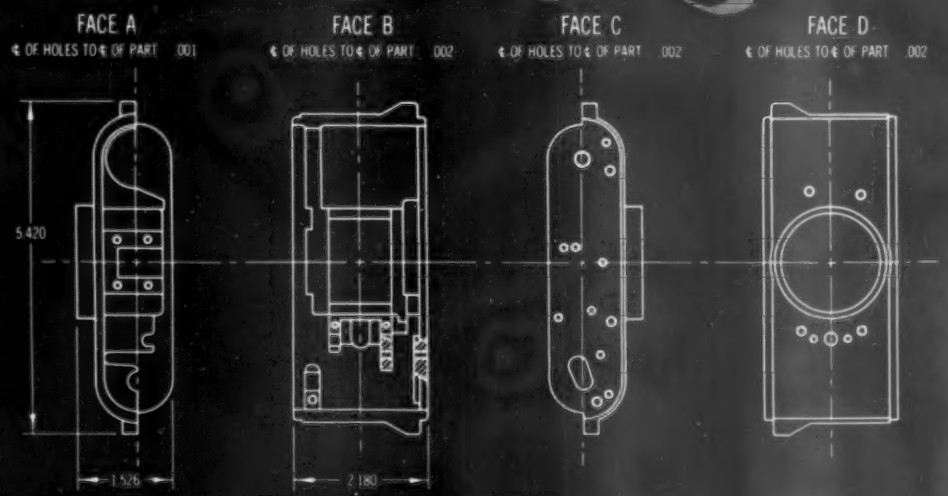
"CALL YOUR DISTRIBUTOR"—

It is NATIONAL'S firm belief, based on long experience, that the local industrial distributor is the one best source for all staple industrial needs—including NATIONAL Metal Cutting Tools.

NATIONAL TWIST DRILL & TOOL — ROCHESTER, MICH., U.S.A.

National

Snapshot of a Profitable Operation



PART: Plastic Camera Case

PRODUCTION: 250 parts per hour for the battery of NATCO A-33 Light Sensitive Multi-Drillers

OPERATIONS:

FACE A—Drill four holes to .070" diameter

FACE B—Drill two holes to .067" diameter and one hole to .0781" diameter

FACE C—Drill six holes to .0781" diameter, three holes to .089" diameter, one hole to .120" diameter, one hole to .082" diameter and one hole to .281" diameter

FACE D—Drill two holes to .070" diameter, two holes to .1465" diameter, two holes to .0781" diameter and one hole to .191" diameter

Battery of Natco A-33 Light-Sensitive Multi-Drillers

NOW...250 of these camera parts per hour are drilled on four faces with extreme accuracy...size of holes from .067" to .281"

When maintenance became too costly a camera manufacturer substituted this battery of NATCO A-33 Light Sensitive Multi-Drillers. An indication of the precision and production of these new NATCO's is evidenced in the following quotation from the camera manufacturer: "Despite the high degree of accuracy which is maintained, the production rate from the battery of NATCO's is approximately 250 units per hour." In terms of profitable operation this NATCO installation represents a big improvement for the manufacturer and is helping him to keep maintenance and production costs in line and product quality high. Let NATCO help you meet rising costs . . .

Call a Natco Field Engineer

to help you solve your problems in Drilling, Tapping, Boring & Facing

Golden Anniversary

1901 NATCO 1951

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices — *1809 Engineering Bldg., CHICAGO • 409 New Center Bldg., DETROIT*
1807 Elmwood Ave., BUFFALO • 2902 Commerce Bldg., NEW YORK CITY

Here's

BALANCED PRODUCTION

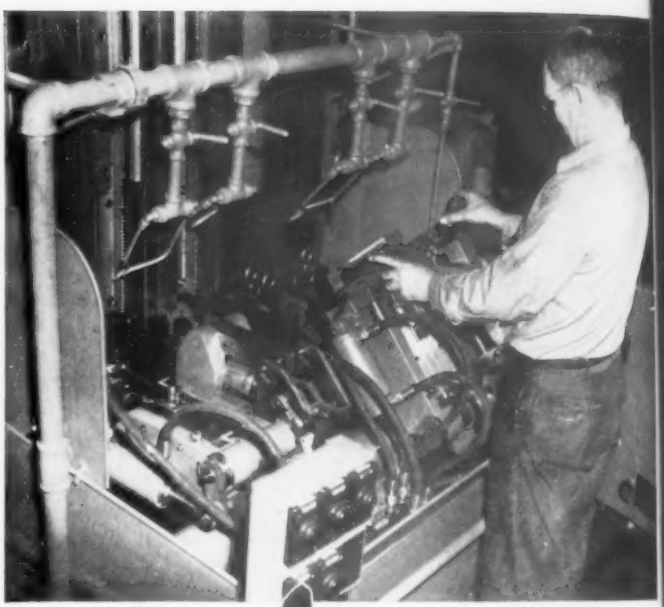
SIMPLE LOADING

AUTOMATIC CLAMPING

the *American* WAY

SIMPLE LOADING plus AUTOMATIC CLAMPING gives the manufacturer of these connecting rods and caps BALANCED PRODUCTION at the rate of 300 complete assemblies per hour.

The installation, engineered the American-way, consists of a Standard American 10-ton, 42-inch stroke vertical duplex hydraulic broaching machine and two, two-station fixtures mounted on completely automatic tilting-type work tables. Fixtures are interchangeable. One station on each fixture holds a rod part, the other a cap. The operator simply PLACES a rod and a cap on the first fixture . . . then pushes the control buttons. The parts are CLAMPED AUTOMATICALLY while the table tilts down and then broached. While one assembly is broached the operator loads the other fixture.



AMERICAN CAN HELP YOU SOLVE YOUR PRODUCTION PROBLEMS

Just as American has helped thousands of other manufacturers during the past twenty-five years, they can help YOU solve your production problems. For the answer to your problems send a part-print or sample and hourly requirements. Address Dept. T.

WRITE TODAY *for your copy of American's Circular No. 300 on American Vertical Hydraulic Surface Broaching Machines.*

AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

Single-purpose machines cut costs

Special automatic drilling and tapping machines save money with high production

Dear Sir:

In an hour one Kingsbury with one operator performs 5,184 operations on lock cylinders. In one hour the other Kingsbury with one operator performs 5,824 operations on gear housings. (Both at 80% efficiency.)

ACCURATE, UNIFORM PARTS

All operations are complete in one chucking. Bushings guide the drills. Fixtures are duplicates, jig bored to minimum toolroom tolerances. Spindles are located to exact indicator readings and run in precision ball bearings. Automatic cycles make every part uniform.

UNIT COSTS IN PENNIES

Man and machine cost 8/10c for all 9 operations on each lock cylinder. They cost 1-9/10c for all 16 operations on each gear housing. These costs are based on 1) the national average wage rate, 2) 80% efficiency and 3) paying off the full cost of the machine and tooling in the first 6000 hours of operation. (No power or overhead.)

SHORT PAY-OFF PERIOD

Each machine will run many times longer than 6000 hours. We used that basis because most firms want their money back in 1 to 3 years. If the pay-off period were longer, they would try other methods.

CHECK COSTS FROM PROPOSALS

We prepare many proposals on tooled machines so that high production plants can compare their costs. Many never result in orders, of course, a fact that our general manager accepts philosophically. "At least they are fun to work out," he says, pausing for a reaction.

So don't hesitate to ask for a proposal. Send a print to our Mr. L. A. Carll and tell him the operations and hourly output you need. And ask him for free bulletins that show 40 setups.

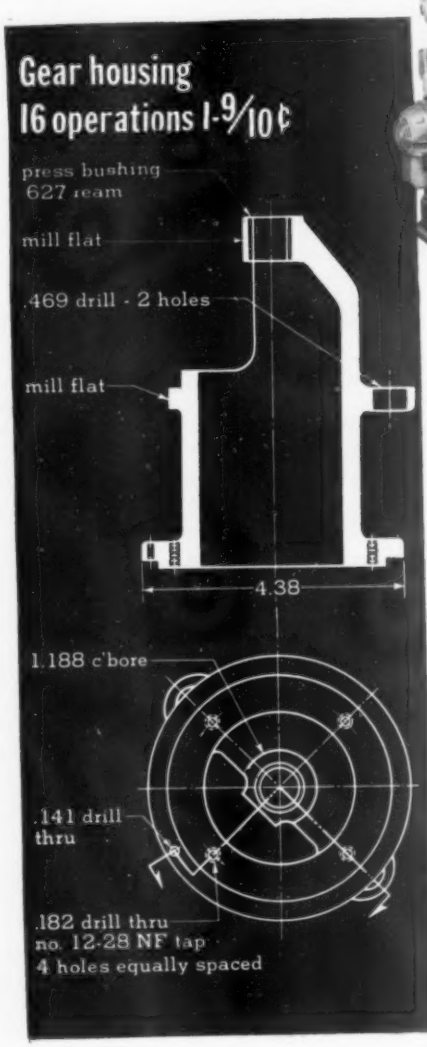
Sincerely,

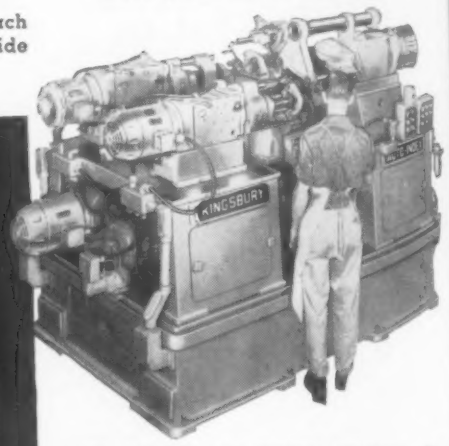
Kingsbury Machine Tool Corp.
20 Laurel St., Keene, N. H.

720 PARTS AN HOUR GROSS. This horizontal indexing Kingsbury drills the 6 pin holes, mills the T-slot and spots the dubb hole in one chucking.

- Six units drill the pin holes. Each fixture has a bushing plate to guide the drills.

- Two units mill the T-slot — one the throat and one the head space.
- An underneath unit spots the dubb hole. A bushing guides the drill.
- A hand plunger ejects each finished part from its fixture.





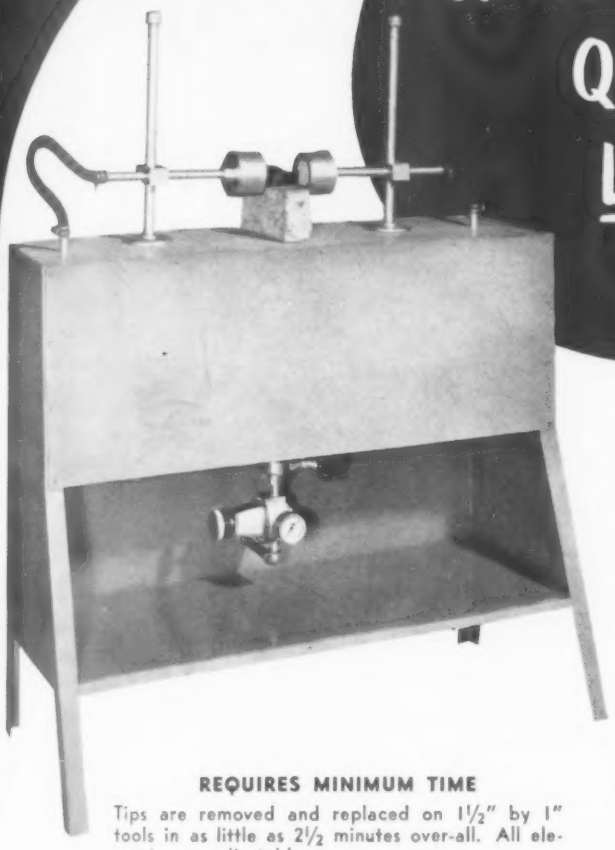
455 PARTS AN HOUR GROSS. This vertical indexing Kingsbury enables 8 automatic units to operate on opposite faces of the part in the same chucking.

- An air-operated mechanism with chute feed inserts the bushing at the first working station on the right. A standard unit reams the bushing to size at the fifth station.
- The 1.188 counterbore is piloted. Its spindle has a 7-inch stroke to reach deep inside the part.
- Standard drilling units with standard milling heads mill the flats.
- Standard units with 2- or 4-spindle auxiliary heads operate on the two .469 and four tapped holes.

KINGSBURY

AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production

REPLACE CARBIDE TOOL TIPS QUICKLY AT LOW COST



NEW TIP-BRAZING UNIT IDEAL FOR METAL WORKING SHOPS

Now — a safe, easy, economical way to braze carbide tool tips on tool shanks. This new tip-brazing unit is a low-cost investment for any shop and will soon pay for itself. Many already in use with proven successful results.

REQUIRES MINIMUM TIME

Tips are removed and replaced on 1½" by 1" tools in as little as 2½ minutes over-all. All elements are adjustable.

ECONOMICAL TO OPERATE

Uses 75 lbs. compressed air in combination with manufactured or natural gas at regular city pressure. No expensive electrical controls required. No complicated equipment to service or maintain.

GREATER ACCURACY

Refractory-cup radiant gas burners, supported by adjustable clamps, can be faced to within ¼ to ½ inch of tool shank.

SAFE, FOOLPROOF METHOD

No "blasting" over the tool because velocity of burning gases is largely dissipated within burner cup. No danger of flux being blown off at tool end before brazing is completed. Less inclination toward oxidation than other methods.

ATTRACTIVE — RUGGED — COMPACT

Modern, streamlined appearance. Requires only five feet of floor space. Sturdy construction to provide long, constant use.

EASY TO OPERATE

Few moving parts and simple operation make it easy for any workman to do the job without special training. Tool tips are easy to get at.

VERSATILE

Unit also ideal for annealing welding tools and heat treatment of small parts. A small oven can easily be adapted to the unit. Higher temperature bronze bond can be used rather than silver solder.

SEND TODAY FOR

FREE CATALOG

VALLEY MACHINERY & SUPPLY CO.
P. O. Box 434, Rock Island, Illinois

Please send illustrated catalog on New Tip-Brazing Unit.

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VALLEY MACHINERY & SUPPLY CO.
P. O. Box 434 Rock Island, Illinois

YOUR HELP IS NEEDED

to get in the

DORMANT SCRAP

At current steel production rates, 50% MORE SCRAP is needed than in the peak year of World War II. The shortage is so real that steel company representatives are calling on every company in the country to find ways of relieving the situation.

Here's How YOU can help

1. **Take a fresh look at your own plant scrap and salvage activities.**
2. **Call in your dealer—sell your scrap—*NOW!***

W&D 3886

Contributed in the National Interest by

ALLEGHENY LUDLUM STEEL CORPORATION

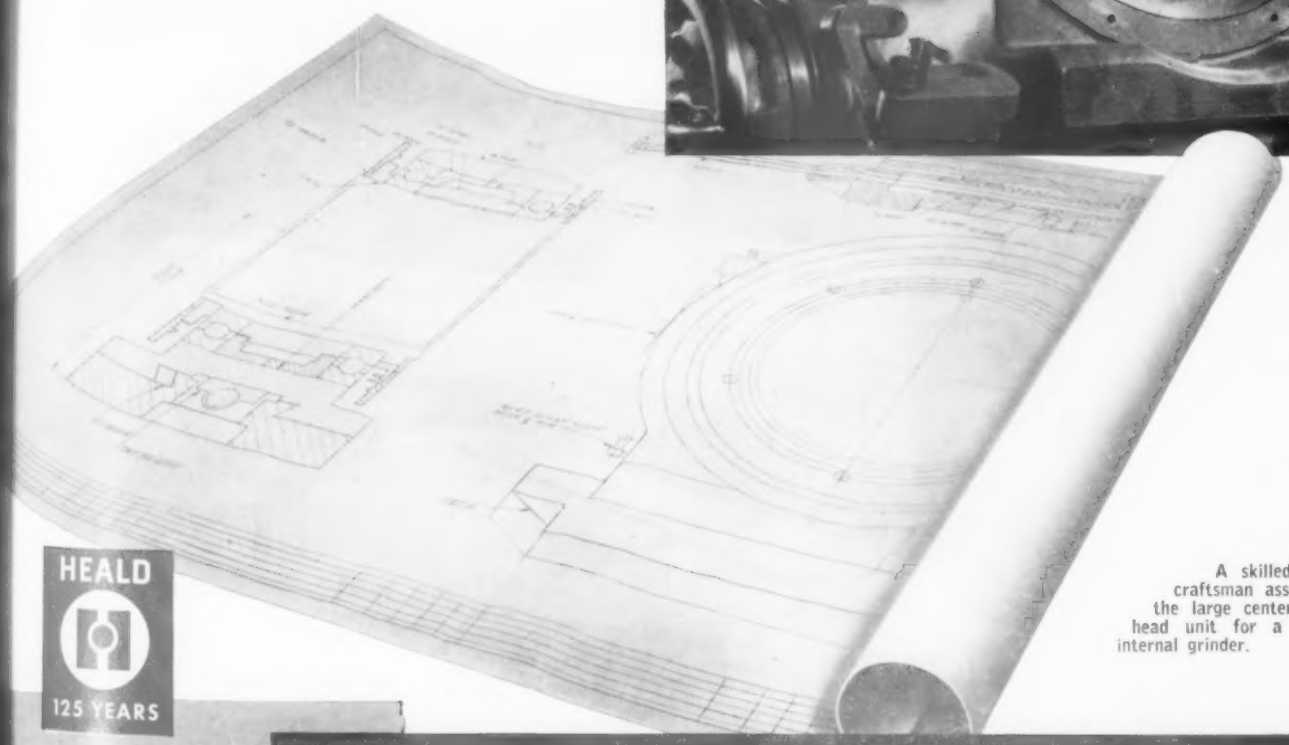
Henry W. Oliver Building • Pittsburgh 22, Penna.

There's extra precision in the ASSEMBLY of every Heald machine

For Heald's skilled craftsmen know that this means more and better production for YOU!

There's one thing that goes into the making of a Heald machine that can not be measured — even with the most precise testing instruments. That's the skill and experience of the men who build it.

Take the complex and intricate assembly operations, for example. They require the steady hand and trained eye of a master craftsman — the manual skill that comes only with years of experience. And these Heald craftsmen know the importance of doing every job *well*. There can be no compromise with quality — no short-cut to perfection. For Heald puts this extra care into every Bore-Matic and Grinding Machine to make sure that it will give extra precision and higher sustained production for YOU.



A skilled Heald craftsman assembling the large center work-head unit for a duplex internal grinder.

HEALD
125 YEARS

Heald machines speed nations production

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

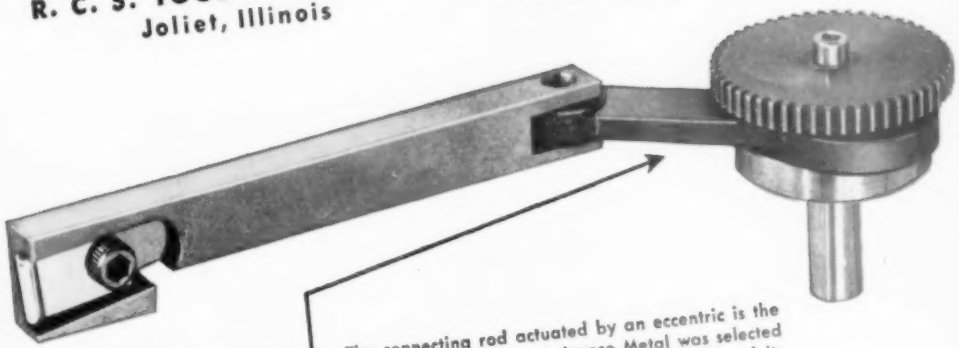
Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

FIGHT WEAR

...in both Product and Plant

New RSC Super Saw attachment for heavy-duty ¼" electric drills provides an all-purpose, portable power-saw for cutting wood siding, "Inselbrick," "Ebonite," "Transite," fibre, Formica, galvanized sheet and other metals, cable, pipe, wire, nails, etc., — any shape: curves, angles, circles. No starting hole is needed.

R. C. S. TOOL SALES CORP.
Joliet, Illinois



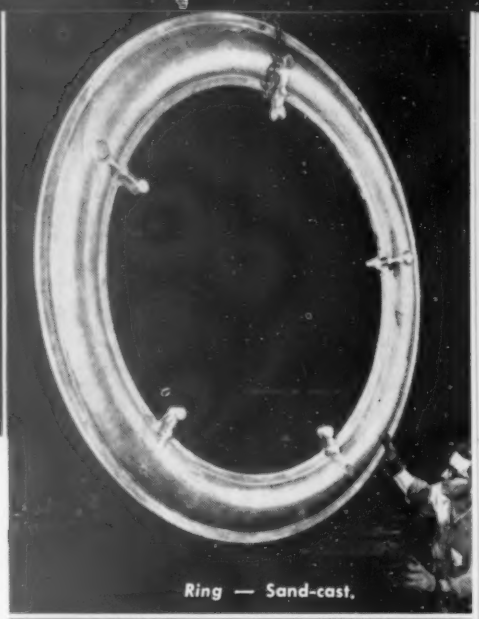
APPLICATION: The connecting rod actuated by an eccentric is the heart of the Super Saw. Ampco Metal was selected as the ideal material for this part, because of its high strength and ability to resist wear.

RESULT: The Super Saw can be used for continuous service, day in and day out.

IT'S PRODUCTION-WISE TO AMPCO-IZE!

blank — Centrifugally-cast

Centrifugal Casting



Ring — Sand-cast.

-with AMPCO* METAL

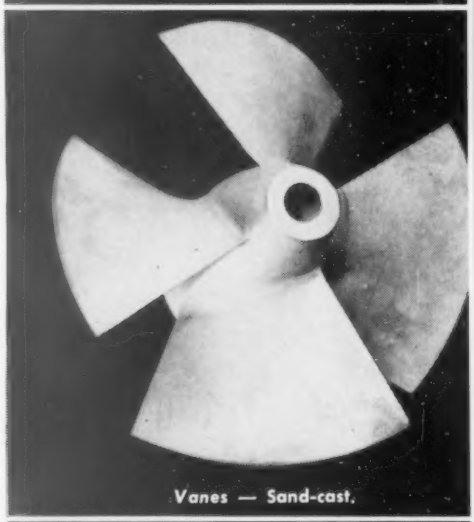
You can save plenty of money and eliminate lots of trouble with high-strength Ampco Metal.

You see, Ampco Metal resists wear — such types of wear as erosion, abrasion and cavitation-erosion. It also resists corrosion. That's why so many designers are putting Ampco Metal to work in their products. They want longer part life, better performance.

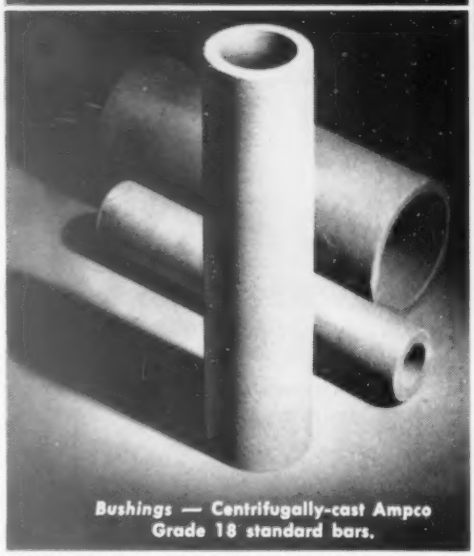
Moreover, thanks to its various hardness ranges, Ampco Metal is ideal for a wide variety of product services and plant-maintenance jobs. It resists both wear and squashing out — stands up under the heaviest kind of service.

And Ampco Metal is easy to use. It's available in bars, sheet, plate, tubing, sand and centrifugal castings, forgings, wire and welding electrodes — practically any form you want. When extra performance life is needed both in manufactured products and in production, specify Ampco Metal. Consult your nearest Ampco field engineer or send coupon for further information.

*Reg. U. S. Pat. Off., Ampco Metal, Inc.



Vanes — Sand-cast.



Bushings — Centrifugally-cast Ampco Grade 18 standard bars.

Tear out this coupon and mail today!

Ampco Metal, Inc.
Milwaukee 46, Wisconsin
West Coast Plant
Burbank, California

AMPCO METAL, INC., Dept. TE-11, Milwaukee 46, Wisconsin

Send me your free Ampco Metal literature giving descriptions and general applications of Ampco Metal.

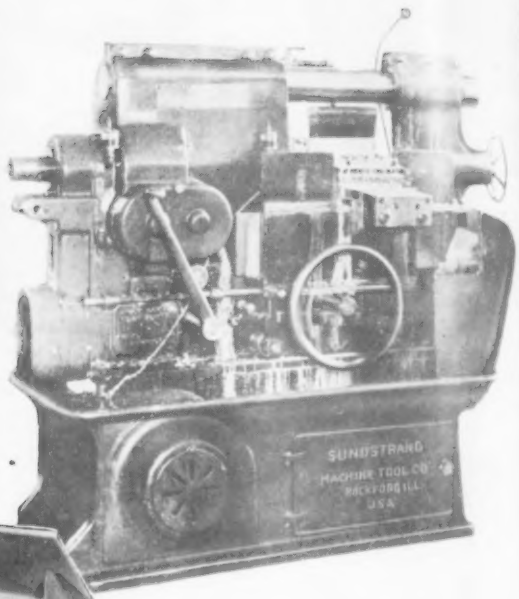
Name..... Title.....

Company.....

Company Address.....

City..... ( ) State.....

New Design Features Plus Automatic Cycling Increase Production From 48 to 200 Pieces Per Hour . . .



Sundstrand 12" Stub Lathe shown at top was built in 1929. New Sundstrand Model 12A Automatic Lathe is shown below.

On Modern SUNDSTRAND *Automatic Lathe*

This is a comparison between a Sundstrand Lathe built 22 years ago and a modern Sundstrand Automatic Lathe of approximately the same size. The old machine represented the latest in design and production capacity of lathes built at that time. The operation is practically the same and yet production has been increased from 48 to 200 pieces per

SUNDSTRAND

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

hour. There are several reasons for this increase. The modern Model 12A Automatic Lathe has automatic cycling. The operator merely loads and unloads the machine and starts the machine cycle. With the new machine, production is increased by faster cycling and faster stock removal while operator fatigue is reduced to a minimum. Other machine improvements are as follows:

12 Sundstrand Automatic Lathe Design Improvements Increase Production On *Both* Long and Short Run Turning

1. In addition to being able to produce more on turning mass production jobs on Sundstrand Automatic Lathes, you can also gain the advantages of multiple tooling on short runs. The quick cycle changeover cuts down the time required to change from one size and type of part to another. Lots as low as 20 pieces are being turned profitably on all four models of Sundstrand Automatic Lathes.

2. **Greater Horsepower**
   To accommodate higher feeds and speeds through use of carbides.

3. **Greater Tool Life**
   As a result of more rigidity in machines.

4. **Greater Speed Range**
   To accommodate various types of metals and part sizes.

5. **Greater Feed Range**
   To allow adjustment for proper feeds in various metals.

6. **Greater Working Range**
   Including length of stroke, carriage adjustment, etc.

7. **Greater Chip Area**
   and easier chip removal.

8. **Greater Cycle Range**
   Provides more flexibility for more complicated cycles and tooling.

9. **Hardened Slides**
   Carriage ways and slides are of steel, hardened and ground.

10. **Better Materials**
    in gear trains, bearings, etc. for longer machine life.

11. **Faster Set-Ups**
    Makes it possible to handle shorter runs.

12. **Screw Feed Carriages**
    For more accurate and finer finish.

FREE

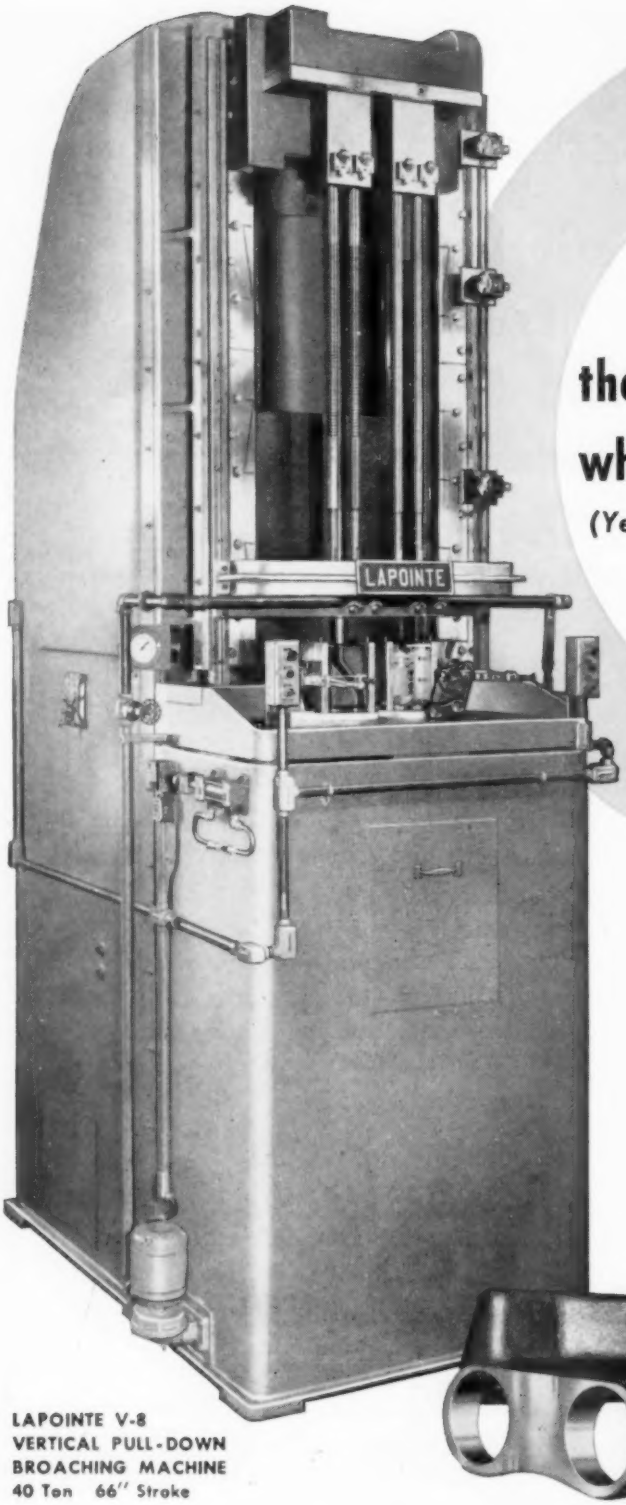
Additional Data

Get all the facts on these four modern Sundstrand Automatic Lathes. Ask for bulletins 713.

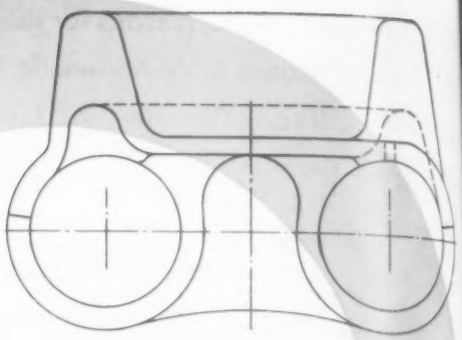
SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2540 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES



LAPOINTE V-8
VERTICAL PULL-DOWN
BROACHING MACHINE
40 Ton 66" Stroke



there's more money in holes when you broach 'em this way!

(Yes, and more speed and more accuracy, too)

IT'S NO TRICK AT ALL
to broach these 1.873" holes at a rate of 200 complete parts per hour . . . 800 holes . . . on this

LAPOINTE

V-8 VERTICAL PULL-DOWN
BROACHING MACHINE

AUTOMATIC BROACH LIFTERS make it unnecessary for the operator to handle the broaches;

BROACHES ARE ROTO-KUT, standard round type, designed with special rear puller for the automatic lifters;

FIXTURES are manually operated, spring clamped.

THIS TANK TRACK SHOE, a chrome vanadium forging, has broached holes with a tolerance ± .0005", and spaced to within .005" center to center. It is another proof of the saying

YOU CAN BROACH IT BETTER WHEN YOU BROACH IT BY LAPOINTE!

Technical data and complete specifications are given in our Bulletin VPD-5

THE *Lapointe* MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
Branch Factory: Watford, Herts., England

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHES AND BROACHING MACHINES

an easy way to *Triple Production* on a machine or press

● On the same presses and machines now in your production line, Talide Carbide Dies can make a big $ and ¢ difference. *Here's why.* Each Talide Die will outwear a steel die by at least 20 times and, in most applications, will last 50 times longer. Think of the cost advantages of those long runs and all the advantages of infrequent "down time" for redressing. Do as others do, *triple* your production with Talide Metal.

Made of the hardest metal known, each Talide Die has the same great strength, phenomenal resistance to wear and consistent uniformity. Talide Carbide never varies in quality.

Talide Carbide Dies are available for blanking, drawing, swaging, extruding, spinning or curling. For other operations, buy Talide bar stock, blades, cutting tools, drill jig bushings, work rolls or diamond products.

Try Talide Metal and triple your production with present equipment. Write us or nearest sales office.

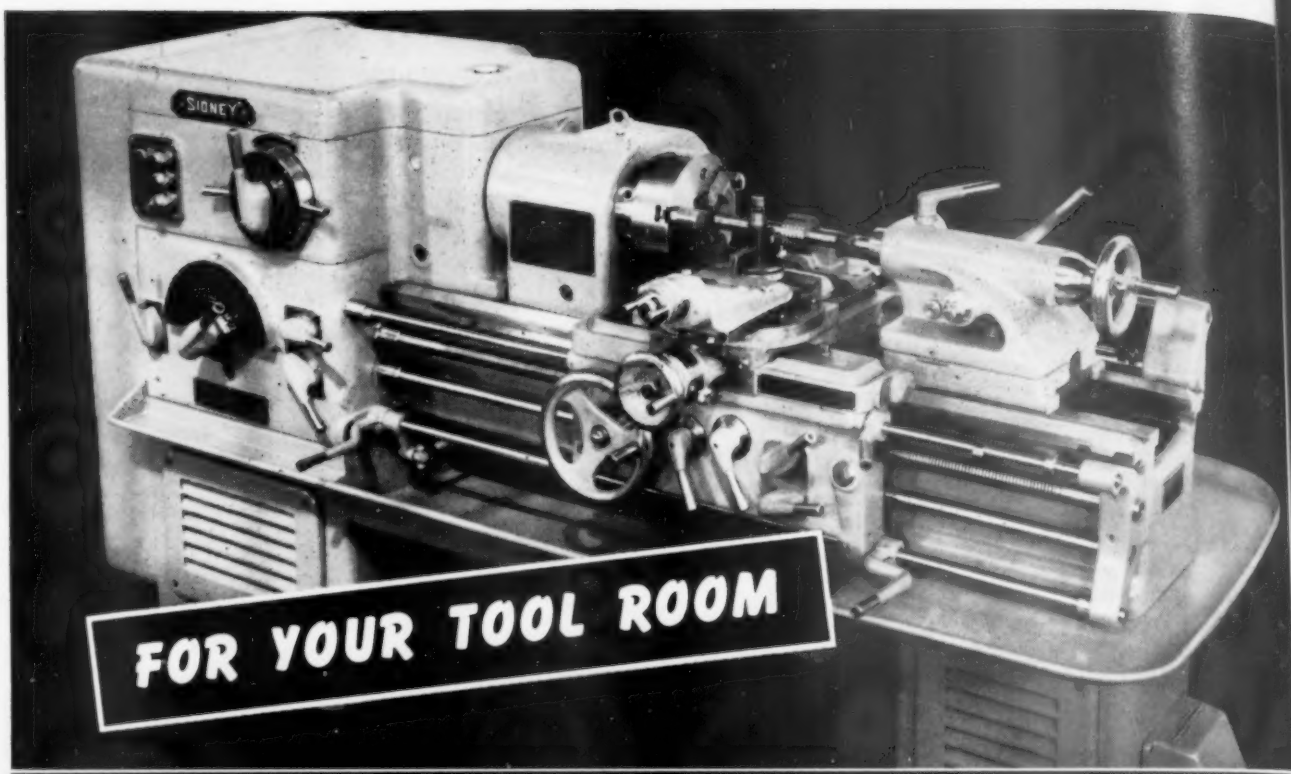
Send for Catalog 50-G.

SINTERED CARBIDES
METAL CARBIDES CORPORATION
MC
TALIDE
YOUNGSTOWN, OHIO.
HOT PRESSED CARBIDES

METAL CARBIDES CORPORATION

YOUNGSTOWN 7, OHIO *Pioneers in Tungsten Carbide Metallurgy*

CUTTING TOOLS · DRAWING DIES · WEAR RESISTANT PARTS



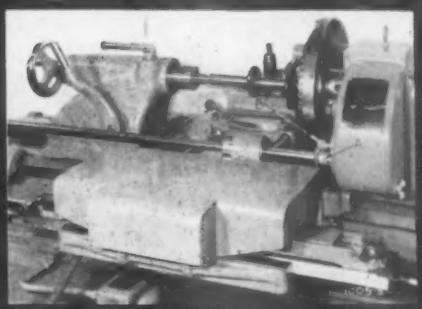
SIDNEY Universal Relieving Attachment

Here is an entirely new development which has many advantages over the conventional relieving attachment.

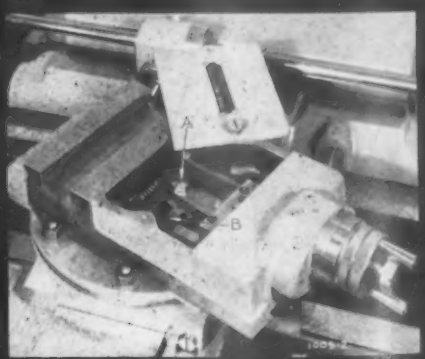
It is adaptable to Sidney Lathes already in the field as well as to new machines and incorporates a 4 to 1 spindle speed reducer integral with the change gear housing thus eliminating the need for 2-speed motors or other costly devices to reduce spindle speed. Universal joints have been eliminated entirely. A timer arrangement enables the operator to pick up any relief at any point with a minimum of effort. A clutch lever is provided to disengage relieving attachment for conventional turning.

This attachment will handle plain external relieving, spiral relieving, form relieving, end relieving and internal relieving.

For complete details write us or contact a Sidney representative.



Rear view showing change gear housing with conveniently located index plate.

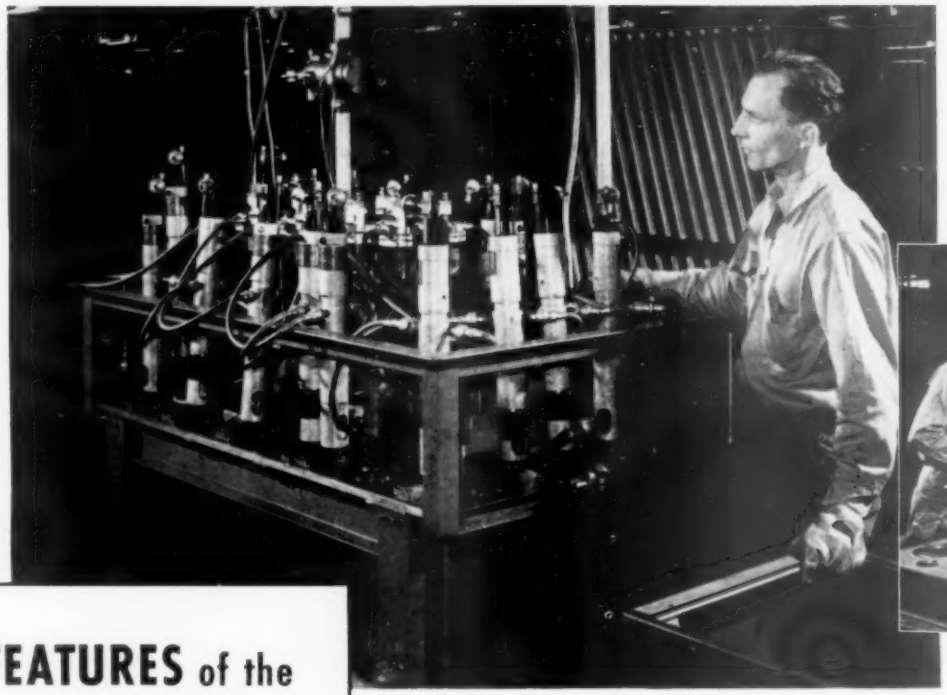


Illustrates adjustable cam throw. Additional cams are not required to obtain various throws.

SIDNEY MACHINE TOOL COMPANY • SIDNEY, OHIO

Builders of Precision Machinery Since 1904

DRILLS FOURTEEN HOLES AT ONCE WITH A FIXTURE AND AIRFEEDRILLS



HAND DRILLING the same holes was tedious work for two men

FEATURES of the Keller Airfeedrill

- Assures accurate holes without costly fixtures . . . can be used with existing jigs
- Attaches in any position and supports itself at any angle
- Operates and is controlled entirely by air . . . with pneumatic cycling to speed production, reduce operator fatigue
- Small size permits it to be used on close centers and in tight places
- Accurately drills parts too large for conventional drilling machinery
- Wide range of speeds and strokes will accommodate light or heavy metal, wood, composition, plastic
- Lightweight portable and stationary models are readily adapted to changing job requirements . . . quickly shifted from job to job

Easily dismantled assembly permits transferring Airfeedrills to other fixtures and other jobs

Keller Airfeedrills* simplify many shop problems, like the one illustrated above. Here Airfeedrills are gang-mounted on a relatively inexpensive fixture, to drill fourteen holes simultaneously in refrigerator bodies passing along a conveyor production line.

This job formerly required the full time of two men at tedious hand drilling. Now, one man drills them all by pressing a single control valve, and spends most of his time at other work!

When a run of one model refrigerator has been completed, the Airfeedrills can be detached and mounted on another fixture in a few moments. Thus they are easily transferred from job to job, and kept in almost constant use.

Write for our descriptive booklet: "The Hole Story of the Keller Airfeedrill." A Keller representative will gladly discuss with you how this remarkable new tool can be applied to your production.

* Keller Tool Company trademark

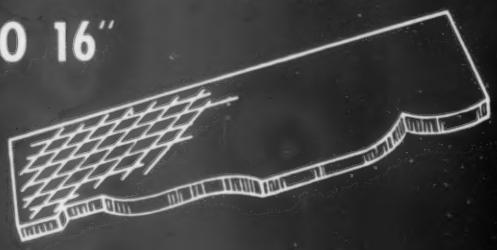
KELLER TOOL COMPANY
GRAND HAVEN, MICH.

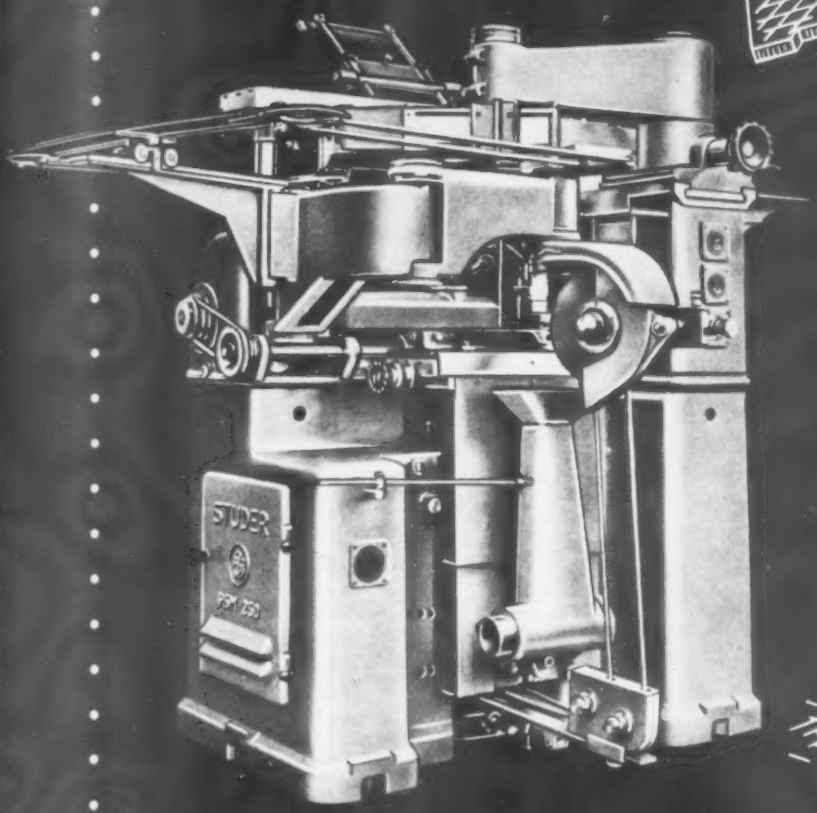
KELLER *Pneumatic Tools*

THE STUDER PSM-250

GRINDS PROFILES UP TO 16"

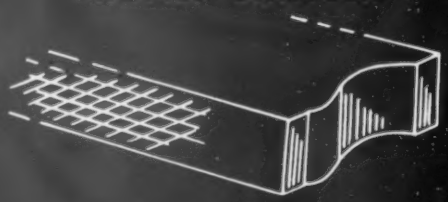
IN ONE SETTING





LARGER FLAT OR CIRCULAR FORM TOOLS, SECTIONAL DIES, GAUGES AND OTHER PROFILE PARTS CAN NOW BE ACCURATELY GROUND ON THIS

NEW STUDER PROFILE GRINDER



INCREASED CAPACITIES
The PSM-250 grinds profiles up to 16" long in one setting and accepts flat work pieces up to 4½" thick and rounds up to 10" diameter. Templates up to 24" long are easily accommodated. The adjustable pantograph can be set in any ratio from 1:1 to 1:10.

CLEARANCE ANGLE AND RELIEF GRINDING
Attachments are available to grind different clearance angles on flat form tools—*without correcting template form;* and, to relief-grind punching and drawing dies.

AUTOMATIC TRACER GUIDE
This attachment automatically guides tracer bar along the template. The automatic, uniform feeding produces improved surface finishes and increases the life of grinding wheels. To guide tracer bar by hand, two screws are loosened to detach the device.

PRECISE GRINDING
Profiles can be ground to a tolerance of ±0.0004". Closer limits are obtainable when large ratios of reductions are employed.

WRITE FOR CATALOG ILLUSTRATING AND DESCRIBING THE NEW STUDER PSM-250

COSA CORPORATION
405 Lexington Ave., New York 17

Your source for all Precision Machine Tools— from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

FLASH

All the lates

new

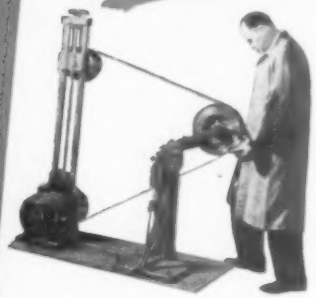
BUSH YOKE SANDER

Manufactured and Sold by
BUSH MANUFACTURING CO.
Clawson, Michigan

You can do almost anything in sanding on this tool — use it either vertically or horizontally, get into small contours (inside diameters, outside diameters), and close radius work. Finish inside surfaces and other spots and areas that have always been comparatively costly problems to handle on a volume basis. It might be just what your present production needs. Why not talk it over with a BEHR-MANNING Abrasives Engineer.

new

The BADER BELT POLISHER



Manufactured and Sold by
STEPHEN BADER & CO.
Rockville Centre, New York

This versatile machine enables use of a wide range of diameters in contact wheels — from 2" to 18" — permitting the finishing of convex or concave surfaces. The contact wheel is an idler, and as the drive wheel *pulls* the belt past the work, no chatter occurs in even heavy cuts. Wheels as well as belts can be changed in only seconds. Wheels may be of any material giving the desired flexibility and contour — cloth, soft rubber, felt, etc.

Your BEHR-MANNING Abrasives Engineer will give you full details.

BEHR-MANNING

NORTON abrasives®

BEHR-MANNING

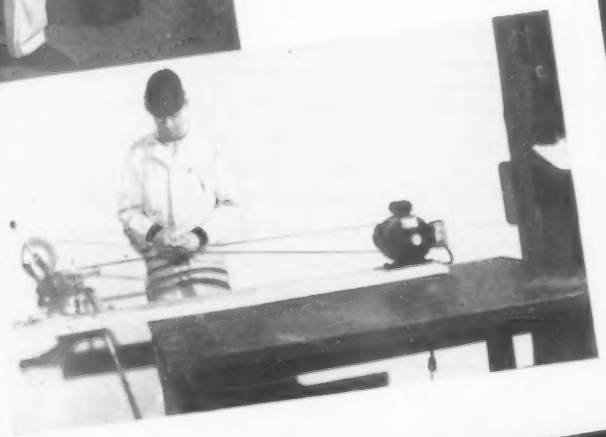
COATED ABRASIVES • SHARPENING

EXPORT: BEHR-MANNING OVERSEAS INC., NEW ROCHELLE, N.Y., U.S.A.

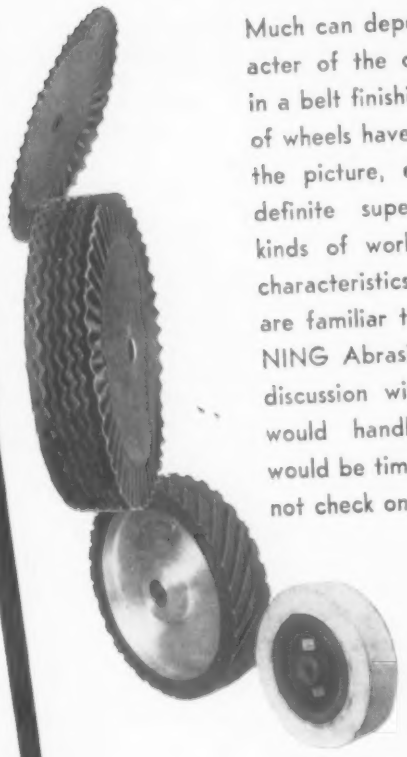
n BELT POLISHING!

New BELT STRAPPING UNIT

inexpensive arrangement which can be built in plant requires a flanged motor pulley, and an of the spring tension type, with a foot treadle to relieve belt tension and permit the operator to remove the belt from the idler pulley. Thread the belt through the hole to be polished, and replace the belt on the idler. Release the foot treadle. It is not necessary to stop the driving wheel as the belt slips on the flanged pulley when tension is eased. Here is certainly a fast way to finish those hard-to-get-at inside surfaces such as the eyes of shears. The BEHR-MANNING Abrasives Engineer has all needed data.



New RUBBER AND BUFF CONTACT WHEELS



Much can depend upon the character of the contact wheel used in a belt finishing job. New types of wheels have recently come into the picture, each demonstrating definite superiority on certain kinds of work. The details and characteristics of all these wheels are familiar to your BEHR-MANNING Abrasives Engineer, and a discussion with him as to which would handle your work best would be time well invested. Why not check on it?

Here's a Packet You Should Have

"Blueprints for Production" covers in detail much that is outlined on these two pages, as well as other new ideas and equipment. Your request brings it — Address Dept. TE-11

TROY, N. Y. DIVISION OF NORTON COMPANY

STONES • PRESSURE-SENSITIVE TAPES

CANADA: BEHR-MANNING (CANADA) LTD., BRANTFORD, ONT.

Production News

ABOUT *Lusol*.. —THE ALL-CHEMICAL METAL-WORKING SOLUTION

FROM F. E. ANDERSON OIL COMPANY · PORTLAND, CONNECTICUT

LUSOL—THE HOTTEST THING ON THE COOLANT MARKET

Today, right now, you can take the first step toward startling production gains in your own shop. The free book, offered below, gives you the facts about Lusol, the metal-working solution which is revolutionizing coolant practices and machining procedures. You'll learn how plant after plant, all over the country, has stepped up output from nearly every machine in its shop. Actual case histories of 50%, 200% and even 500% increases in machine speeds and production rates!

Lusol replaces soluble oils and emulsions, as well as regular cutting oils on many operations.

NEW TYPE COOLANT—The simple, factual evidence in this book shows *why* Lusol cools faster, increases tool life, reduces the number of grinding wheel dressings. You'll see how Lusol, an oil-free concentrate added to water, makes the best coolant you ever used. How it makes water wetter, so it removes heat faster. How it decreases the surface tension of water, so it penetrates to the very cutting edges of your tools and keeps grinding wheels from loading up.

You'll learn the extra advantages possible with oilless Lusol. Advantages like elimination of degreasing before painting or assembly. How floors and workers' clothes stay cleaner. No oil-soaked shoes. How Lusol licks machine odors and dermatitis. And how it protects machines and products from rust.

SAVINGS IMPRESSIVE—Truly, these are savings so important and far-reaching that no one who owns or operates a machine tool can afford to pass them up. So today take time to ask for your copy of the 20-page book, "Lusol, the all-chemical metal-working solution."

Over 40,000,000 Gallons of LUSOL SOLUTION USED TO DATE

In plants all over the nation, in almost every type of metal-working operation, over 40,000,000 gallons of Lusol solution have been used, boosting production rates, saving tools and lengthening grinding wheel life.

In each of these applications Lusol has replaced another coolant, showing substantial savings. Obviously, an enormous amount of technical know-how has been accumulated during these conversion periods. This data is constantly sent to Lusol sales engineers in the field. Your local Lusol sales engineer, listed in the classified phone book under "cutting oils," is well equipped to answer your questions.

users say*

case histories of Lusol at work

A BEARING MAKER—"Look at that fine finish! No smoke around the machine, and the bearing-half comes off the broach so cool it can be gauged for accuracy immediately."

•

A JOB SHOP—"41 drills and 25 taps were required for producing 1,984 pieces in 50 hours. Changed to Lusol and produced more pieces in same period with 12 drills and 8 taps."

•

A MOLDING MANUFACTURER—"Lusol keeps the machines clean; a distinct advantage over the lubricant we formerly used. The men like Lusol because they can see the work clearly, right up to the time the metal enters the rolls."

•

A MACHINE TOOL BUILDER—"We remove 245 cubic inches of cast iron per hour in that surface grinder. Instead of 17 wheel dressings per chuck load formerly required, only 7 are needed now with Lusol. We're going 100% to Lusol."

*User names furnished on request.

LUSOL proves mild and non-irritating to workers' hands

The cleansing action of Lusol, together with its super-wetting properties, sometimes prompts questions about dermatitis. "How does such an efficient metal-working solution affect workers' hands?" It doesn't!

The case of the man shown above is typical of Lusol's performance in actual shop conditions. Sulfurized cutting oil, formerly employed, so irritated this man's forearms that he had to wear the plastic sleeves you see in the photograph. With Lusol in his machine, he has discarded the sleeves; has no skin trouble at all.

FREE BOOK

Get complete facts about Lusol by writing for this 20-page booklet. It contains information on machine cleaning, maintenance of Lusol solutions, elimination of dermatitis and odor in machines, plus many case histories of Lusol at work. Write F. E. Anderson Oil Company, 213F, Portland, Conn.

THE TOOL ENGINEER
Publication of The American Society of Tool Engineers

The Tool Engineer

a Letter from the Editor...

By way of a progress report on ASTE's Clearinghouse program to aid industry in the defense effort, we're happy to report both a working force and a growing history of concrete help to subcontractors and prime contractors both.

More subcontractors and major contractors are needed to fill the growing requirements being received. At the same time, scores of additional facilities listed with the Clearinghouse in the past few weeks enable us to offer a considerably wider range of available facilities in many types of special machine work and currently tight operations.

In addition, beginning immediately the Clearinghouse will be able to provide help to contractors with machine tool headaches. Only a brief mention can be made in this space—the last page to go to press—but additional information will follow in next month's issue.

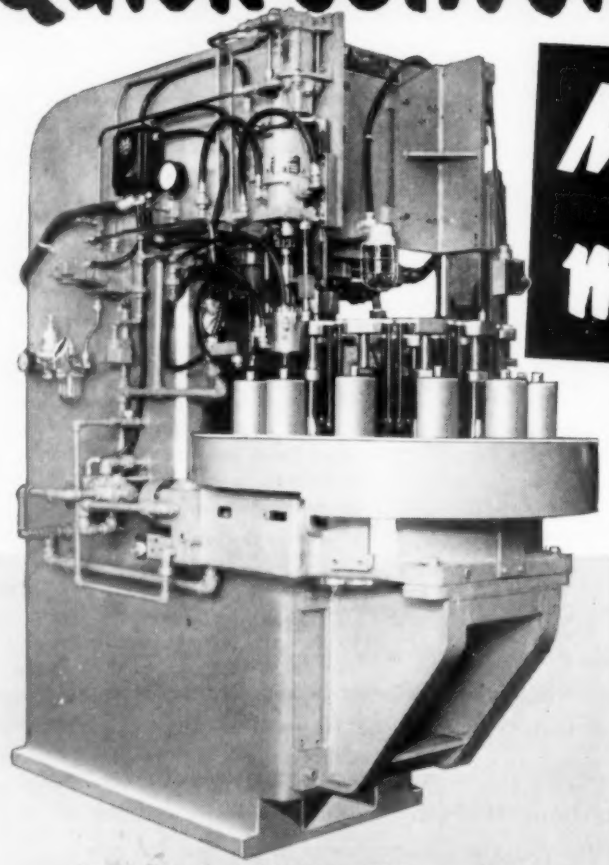
Made available to *The Tool Engineer* is a listing of some 6,000 machine tools being held in reserve by the Ordnance Corps of the Army, and which are available on a lease basis to contractors engaged in work for the defense program. The Clearinghouse will, therefore, be able to provide the following information: the availability of a particular machine tool, its capacity, and its present location. Negotiation can then be initiated with the Ordnance district in which the machine or tool is located.

We hope this added service will be of value to industry.

Gilbert P. Muir

Quick conversion cuts costs

MULTIPRESS® makes it easy!



Standard MULTIPRESS makes quick, automatic work of hydrostatic testing operation

The ingeniously tooled unit above is a striking example of the ease with which any standard Multipress can be adapted to changing needs. The press is equipped with a 12-station HydrOILic Index Table. At each station an oil-filled steel housing surrounds a spindle over which finished rocket bodies are inserted. At the index station just ahead of the press ram position, the rocket bodies are automatically screwed down and sealed shut by a hydraulic device attached to the press frame. Now ready for testing, the assemblies index under the press ram, where compression builds up terrific oil pressure within the rocket body. Units that hold up under these pressures are automatically die stamped and loosened from the fixtures by auxiliary hydraulic units interlocked with the press circuit. If failure occurs, the press stops instantly, a red warning light goes on, the marking device fails to operate, and the press is locked out of operation until authorized government personnel can inspect and record the failure, and reset the electrical system with a special key.

DENISON HydrOILics

Multipress has operating advantages and automatic control features that pay extra dividends *two ways!*

1. They meet armament production needs with higher speeds, quality control, and fewer rejects.
2. They make it easy to convert quickly to a wide range of civilian production needs, at any time.

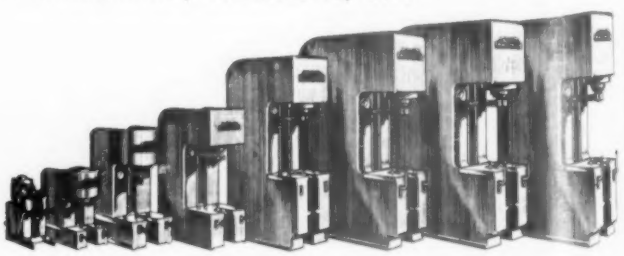
Some of these Multipress features, *proved in more than 6000 applications,* include:

1. Automatic time delay, for ram dwell or similar needs.
2. Automatic inspection devices easily interlocked with the press hydraulic circuit.
3. Automatic Index-Table Feeds permit one, two or several operators to load fixtures at up to twelve stations while parts are being processed under the press ram. Other automatic feeds also available.
4. One or more auxiliary operations (as in the job described at left) can be handled by devices attached to the press frame and interlocked with the hydraulic circuit of the Multipress itself.
5. Safety is provided by several Multipress features. The ram is under complete, split-second control throughout its entire sequence. With Multipress Index-Table Feed, operator's work is removed from the ram area.
6. Low initial cost plus relatively low cost of adding interlocked auxiliary units and accessories cut costs of "tooling up" for specific operations.
7. Full, stepless adjustability and accurate control of the ram's speed, pressure, and stroke length assure easy adjustment to changing production needs.

These are only a few of the Multipress features that cut production costs *and save time and money* whenever you convert from one type of production to another. Deliveries too, are better when standard presses can be utilized.

Multipress is available in eight frame sizes, with capacities of 1, 2, 3, 4, 6, 8, 10, 15, 25, 35, and 50 tons. Standard accessories for numerous special needs. Write today.

The DENISON Engineering Co.
1191 Dublin Rd., Columbus 16, Ohio



The Tool Engineer

Editorial

Security Wise—and Information Foolish

Recent national discussion on the problem of safeguarding the national interest by restricting publication of certain information has centered about our country's newspapers and magazines directed to the layman and concerned primarily with non-technical news coverage.

The technical societies and technical publications of the United States have had, since the beginning of World War II in particular, a problem of considerable stature in releasing for the benefit of American industry news of a technical nature which is needed by industry to perform a continuing job.

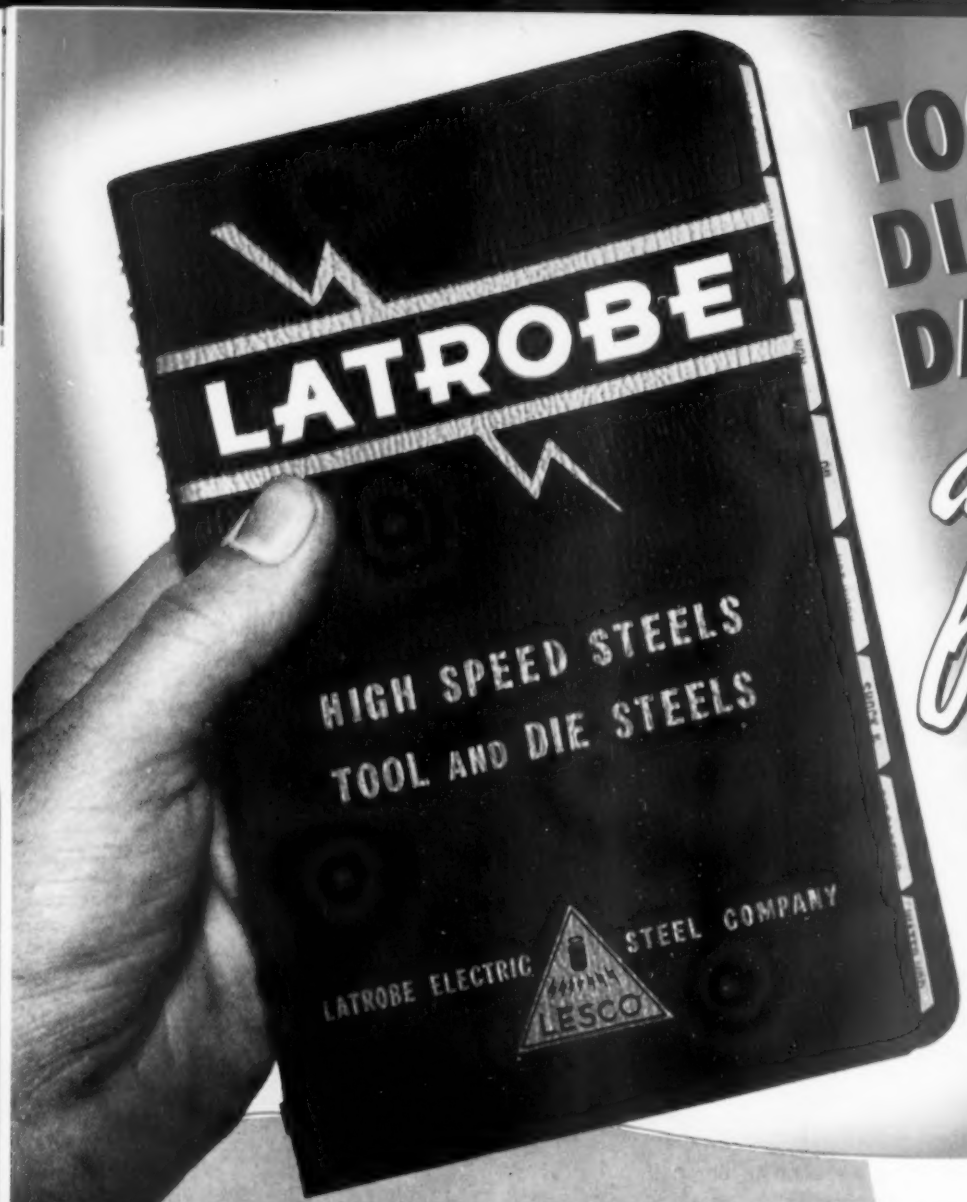
Censorship, or withholding of technical data by government agencies and the armed forces, is directed at processes or methods which would tend to divulge the nature of a secret end-product, or processes which in themselves represent material of value to the enemy.

No responsible citizen would, of course, advocate the release of such material where publication would be detrimental to our national interest. But, unfortunately, an overall aim such as this, when interpreted by many persons in various branches of our government and armed forces, soon becomes clouded. The result is that first, interpretations between different branches become contradictory. Material restricted by one is released by another, and both confusion and misunderstanding are end products.

Secondly, and perhaps more important, is that because of lack of detailed information on new processes and materials, American industry wastes countless man-hours and dollars worth of materials in individual attempts to experiment and thus develop a working technique. Release of specific information in such a case would undoubtedly be of interest, and perhaps of value, to the enemy. But compared to the savings in time, money and material that would be realized in our own defense effort, the advantage to the enemy is a fair price.

J. J. Demuth

PRESIDENT
1951-1952



TOOL AND DIE STEEL DATA... *at your fingertips*

- ★ ANALYSES AND PROPERTIES
- ★ RECOMMENDED HEAT TREATING
- ★ FORMS IN WHICH FURNISHED
- ★ TYPICAL APPLICATIONS

PUBLISHED AS ANOTHER LATROBE SERVICE TO TOOL AND DIE STEEL USERS . . . SHOPMEN, TOOL AND DIE MAKERS, FOREMEN, ENGINEERS . . . THIS HANDY, POCKET-SIZE REFERENCE BOOK GIVES YOU UP-TO-THE-MINUTE INFORMATION ON EACH OF THIRTY-FIVE OF THE MOST WIDELY KNOWN AND USED TYPES OF TOOL AND DIE STEELS PRODUCED BY LATROBE ELECTRIC STEEL COMPANY.

Eighty-six pages, 4" x 7", bound in a flexible cover, this manual is designed to fit your pocket. Reverse sides of index tabs show tables and data of practical value in everyday practice:

- ★ Decimal equivalents of one inch
- ★ Hardness, temperature and millimeter conversion tables
- ★ Weights, by size, of hot rolled round bars, drill rod, flat and square bars.

Handy index tabs for easy selection of:

- ★ High Speed Steels
- ★ Non-deforming Die Steels
- ★ Oil Hardening Die Steels
- ★ Hot Work Steels
- ★ Shock Resisting Steels
- ★ Die Casting Die Steels
- ★ Water Hardening and Carbon Steels

This manual is yours for the asking . . .
USE THE COUPON BELOW — TODAY !

LATROBE ELECTRIC STEEL COMPANY
LATROBE, PENNSYLVANIA

SOLE PRODUCERS OF DESEGATIZED BRAND STEELS

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Sales Agents: BIRMINGHAM, DALLAS, DENVER, HOUSTON, ST. LOUIS.

LATROBE ELECTRIC STEEL COMPANY, Latrobe, Pa.

Gentlemen: Please send me, at once, your tool and die steel manual at no obligation.

NAME .....
TITLE .....
COMPANY .....
STREET .....
CITY ..... ZONE..... STATE.....

Comparison of Progressive and Single-Station Dies

By R. J. Schimpf

SMALL MOTOR DIVISION
WESTINGHOUSE ELECTRIC CORPORATION

WHAT CHARACTERISTICS of a job make the use of a progressive die rather than a single-station die more advantageous? What are the advantages of the progressive die, and does the single-station die have similar advantages? These are the questions a tool engineer must apply to every new job.

Since the conditions prevailing at the manufacturing facility govern the choice of dies, this discussion is limited to a particular problem, the production of rotor and stator laminations for a ¼-hp type of motor. Producing lamination punchings of either high or low silicon content has always been a difficult problem to motor manufacturers because of the many punchings per unit required. The quantity factor, coupled with the precision needed for good lamination die performance, has put lamination die design, construction and use in a unique class. Both single- and progressive-station dies are used to produce substantially the same punchings, so that in this instance an analysis and comparison of the advantages and disadvantages of each type of die can be made.

In Fig. 1 are shown six single-station dies which were formerly used to produce rotor, yoke and pole punchings. By using the progressive die shown in Fig. 2, one punch of the press produces the same punchings.

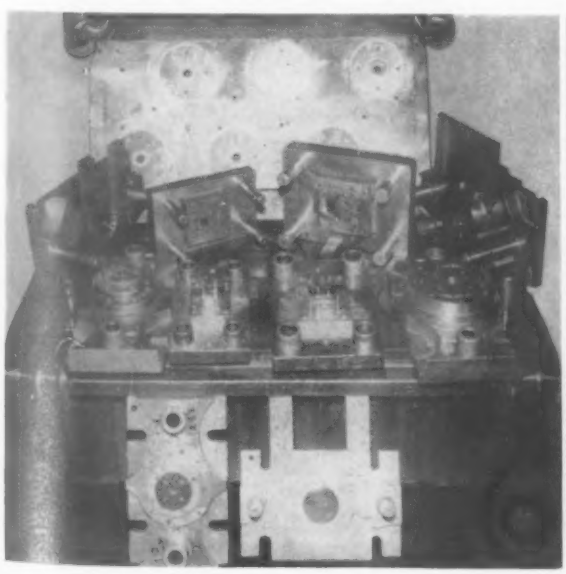
Progressive Dies

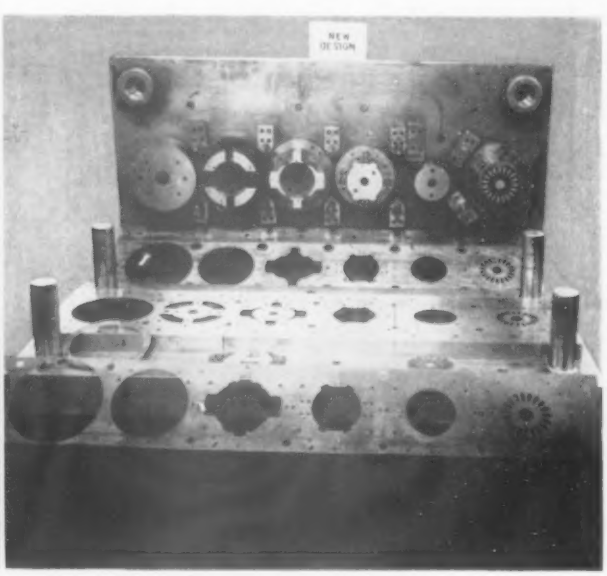
Certain punching design requirements can be produced best by the use of properly designed progressive dies because the various stages of the die permit progressively blended perforations. Using a single-station die here would increase the complexity of the job.

If design permits, progressive dies will produce the following advantages:

(1) A minimum of material will be required by using a scrapless type of design.

Fig. 1 (left). Six single-station dies are used to produce rotor, yoke and pole punchings. Fig. 2 (right). One punch of the press produces rotor, yoke and pole punching with a progressive die. Result is less handling, less total die cost.





(2) Ability to utilize material that may be normally thrown away by designing into the stages of the die other component punchings. See Fig. 3. (Numerous progressive dies are in use that produce what possibly seven single-stage dies are required to do).

(3) Success in meeting concentricity requirements—semi-compounding of specific punchings can be produced in certain stages.

(4) Minimum handling of products by using stacker chutes in conjunction with the die; parts are matched, ready for next operation.

(5) Less press space required to produce a given volume of work as noted under (2) and, consequently, less capital investment and maintenance.

(6) Less total die cost by combining operations.

(7) Relatively close concentricity controls by using pilots in the indexes of the die.

(8) Elimination of a machining operation in the case of the rotor-stator type laminations—the air gap material can be removed, depending on the ultimate motor requirements.

(9) More opportunity for operator to take care of other tasks when coil material is used. Also, coils permit automatic lubricating of material and easy scrap removal, eliminating what is normally an extremely aggravating condition.

(10) Feed rolls and coil materials permit more strokes per minute.

While the above list of advantages may seem impressive, a careful analysis will show that the construction of the die and materials handling problems may entail the following disadvantages:

(1) When coil material is used, good storing and handling methods must be utilized to prevent coil buckling, or deformation, which could prevent production of good punchings by causing restrictions through the die during feeding. This can cause serious damage to the progressive die when miscuts are encountered.

(2) Even with the use of lifters on open face dies to raise the material off the die surface, difficulties are encountered with slugs which rise up and restrict the proper index movement of the material to cause miscuts.

(3) If any one small detail of the die should fail, complete removal of the die for repair may be required.

(4) Considerable down time of the press results from the longer installation and removal times of such dies. The higher press speeds generally used are, therefore, not true figures to use for loading schedules.

(5) At times, extremely bad conditions result from material being thicker on one side of the coil. If a 0.001-in. difference is found on a 0.025-in. thick stator punching used for a core build-up of three in., it would result in an out-of-parallel build-up of 0.120 in. (There may be some cases where half of the stack can be reversed to prevent this, depending on punching design.)

(6) Some portions of the die are weaker in structure due to the close coupling of the stations. This restricts the use of the stronger structures of single-station dies.

(7) Alignment of dies is difficult to maintain because all the mating parts are mounted on the one die set.

(8) If the design of the punching requires it to be finished with relatively thin web sections, difficulty will be encountered in consistently maintaining close tolerance of shaft holes. The strains set up in the lamination material are relieved in the final stages of the dies, and are dependent on those material stresses. Variations in out-of-roundness are the result.

(9) While punches can be guided by the stripper, the nature of the structure does not permit the best supporting methods.

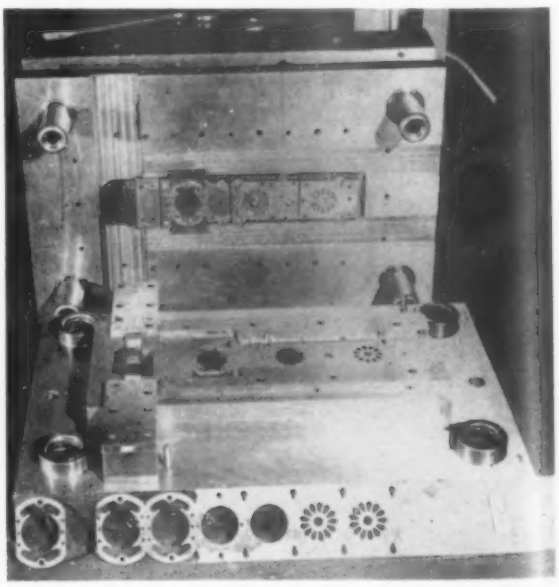
Single Station Dies (Full Pierce)

Many types and sequences of single-station dies are used throughout industry, under many different sets of conditions, but the comparison here will be confined to their use on lamination punchings where production is high enough to justify the best methods of full-pierce-die type of operation.

Advantages:

(1) If production quantities permit, wide coils can be run through a multiple-impression (cookie) die to permit close interlocking of the punchings and a close approach to the minimum of scrapped material. See Fig. 4.

Fig. 3. Progressive die allows minimum of scrap and concentricity is assured.



(2) Where wide sheets can be used, a minimum of out-of-parallel will be experienced, which will result in a more uniform core build-up. (When variations in material thickness occur, they are offset by the shuffling in later operations.)

(3) Single-station dies offer versatility to manufacturers faced with the need of a multitude of similar punchings from the basic blank size and thickness, but having slight changes in perforated slots, center holes or vent holes. By use of various single-station dies, combinations of requirements can be produced with a common blank and separator die.

(4) Should die trouble be encountered, it is far simpler to replace the single-station die with a standby die at a minimum of press down-time.

(5) Die structures can be more rigid because of available room. See Fig. 5. Close fitting of guided strippers results in longer die runs, per 0.001 in. of die, by preventing sheared punches when miscut conditions are encountered.

(6) Ease of repair or maintenance is due to less weight and the single station.

(7) Since the incoming blank can be delivered well above the top of the die surface, less trouble results from slugs rising and restricting the proper positioning. See Fig. 6.

(8) When the open-face type of die is used, it is easy to observe operating conditions.

(9) Procurement time is much less.

(10) Relation of grain of material to perforated slots is at random which results in a more uniform magnetic field in the built-up cores.

Disadvantages:

(1) More presses, floor space and die storage space is required.

(2) Extra handling of punchings through the various die operations is required.

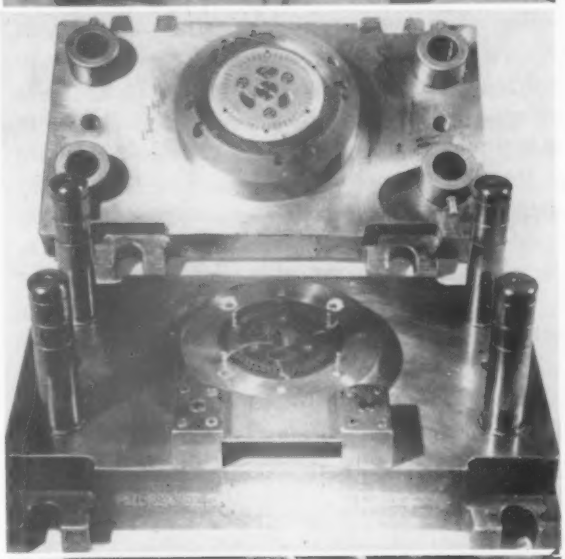
(3) Added set-down areas are needed.

(4) Total die costs are greater than for the progressive dies that produce the same punchings.

(5) Press speeds are usually slower.

(6) Concentricity of punchings through the press sequences is a major problem. (This depends somewhat on type of die).

(7) No positive feeder devices are available to deliver punching into die area and eject it without a relatively high percent of scrap, miscut, or unperforated punchings that feeder failed to deliver properly.



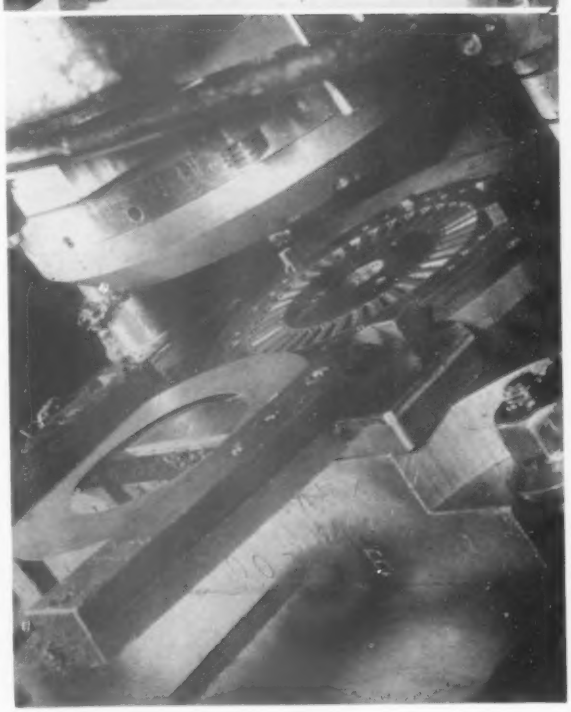


Fig. 4 (top). Close approach to scrapless method with single-station die is obtained by use of wide coils of material and a "cookie die".

Fig. 5 (center). More rigid die structures are possible with single-station dies.

Fig. 6 (bottom). Less trouble results from rising slugs because incoming blank can be delivered well above die surface in single-station die.

Casting Resins for Tooling

By Walter M. Stark
AMERICAN RESIN CORPORATION

DURING THE PAST TWO years, a cooperative project between the automobile, airplane, forging and foundry industries on the one hand and independent tool, die and pattern makers and a resin manufacturer on the other hand, has led to comparatively extensive use of casting resins in these industries.

The introduction of casting resins for production tooling offers numerous advantages in comparison with the materials and methods used previously in many applications in these industries. Plastic tools are appealing because they are usually light, are readily manufactured by simple methods, and do not require extensive finishing. The low weight often reduces a mechanical operation involving heavy tool handling equipment to a manual operation where two men can pick up a spotting frame and lift it into place. The investment in equipment for casting resins properly, i.e., equipment for weighing, mixing and heating, is comparatively low, and handling of the material requires little effort.

Casting resins used most extensively to date are of the phenolformaldehyde type. These resins are amber-colored liquids which set (become solid) when an accelerator (catalyst) is added. The casts thus produced are highly stable and have properties which are desirable for the following applications: duplicate master models, master die models, sinking masters, die try-out fixtures, spotting models, checking gages and fixtures, drill jigs, hammer forms, Keller models, core boxes, match plates and loose foundry patterns. In addition, the material has been used for checking forging die cavities and making replicas where accuracy and permanency are desired. Production pieces have been made from these casting resins for consumer use where conventional methods of manufacture were too costly.

Two types of accelerators are available for setting the resins, one for casting at room temperature and the other for use when heat must be applied. In the latter case, the recommended temperature is 120-150 deg F. Castings are usually made at room temperature when possible. These catalysts are of the mineral acid type which makes it necessary that the surfaces against which the casting is poured be protected by an adequate coat of protective lacquer or enamel, and over that, a continuous coat of paste wax or other parting agent. The lacquer coating or equivalent protects against the corrosive action of the catalys, and the wax or parting agent insures proper separation after the cast is set.

All materials which go into a batch must be weighed, and the mixing and compounding must be done so that the least amount of air is included and a maximum homogeneity is obtained.

Applications and Construction Types

The automobile industry has used casting resin for tooling for portions of all the 1952 models and in some of the 1951 models. Extensive application of plastic tools has been made in spotting frames which serve to properly finish the sheet metal presses and stamping forms. These spotting frames are fitted to the die to be finished and bluing or other marking agents highlight the spots where finishing is still required to make the die

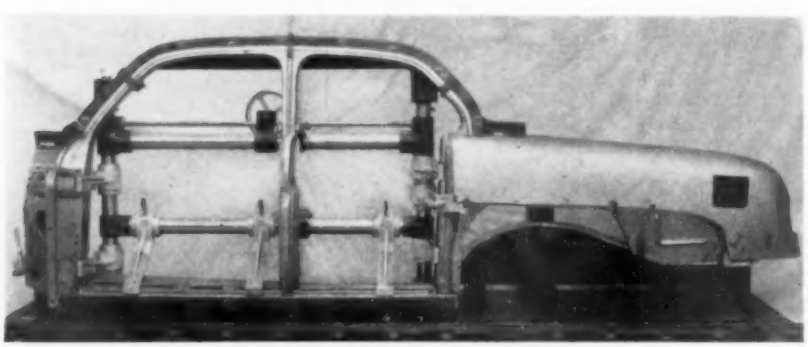


Fig. 1. A side panel assembly gage in which the rocker panel and the rear fender portions are made of plastic while the straight sections are steel.

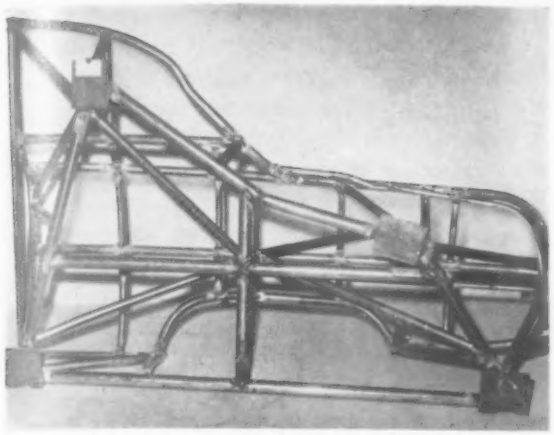


Fig. 2. Steel frame for quarter panel master model.

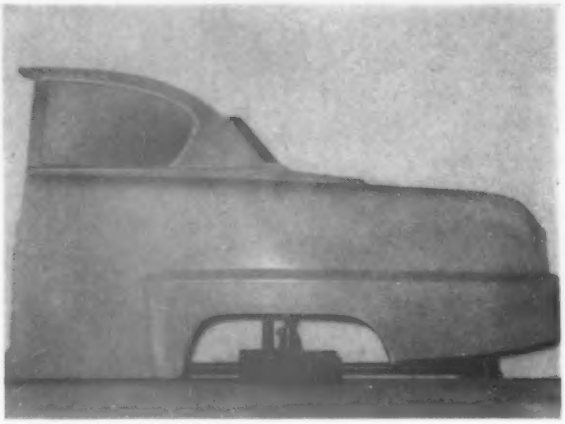


Fig. 3. Finished plastic casting for quarter panel assembly.

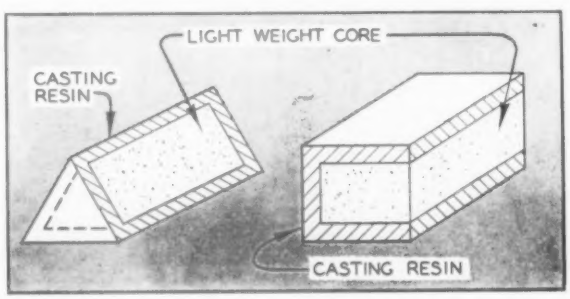
conform to the contour of the sheet metal part to be pressed. In addition, plastic tooling has been widely used for making checking fixtures, often called inspection gages, which assure accuracy of the finished sheet metal or even non-metallic part; checking gages for such varied parts as fenders, floor-pans and floor-mats have been built with the casting resin. It has also become increasingly acceptable to build with casting resins in a combination with other tool building materials such as steel and aluminum. In this application, complex contoured parts such as the rocker panels and rear fender portions in the side panel assembly gage shown in Fig. 1 are built in plastic, whereas some of the straight sections are built in steel.

Probably the most advanced problem tackled in the automotive tooling line is the development of plastic master models without the intermediary use of a mahogany model. To appreciate this development it must be understood that to date it has been accepted practice to develop first a clay model to fix the lines of the particular style. This clay model serves as a guide to make the so-called master layout or print, and this in turn is used to make the templates. These templates then are used to build the master mahogany model. In the development discussed here, a master model is developed directly from the clay model by using the principle of casting and recasting rather than resorting to the more time-consuming manual building of the mahogany master model. Indications are that most of the major automobile manufacturers are conducting projects to perfect this process in conjunction with the independent shops and the resin manufacturer. The American Resin Co. has been instrumental in developing recently a material which the limited tests available to date indicate is a resin that can be cast in non-supported pieces and will not move after it is once completely set; further, it is reasonable at this time to assume that such materials can insure complete cure once the reaction has been started. The other direction in which the industry as a whole has done extensive work is casting construction. A few of the most successful ones and their uses follow.

1. Casting on steel frame. This process is a recent development in connection with plastics, but is, of course, an accepted practice in the plaster and low-melting-alloy field. The results have been excellent and accuracies over a comparatively long time (about two years) have been on the order of ± 0.005 in. in pieces of 48-in. dimensions. Figs. 1, 2 and 3 show some typical items. Applications include all sheet-metal tooling ranging from master duplicate models to spotting frames and checking fixtures. The thickness of plastic ranges from one to three in. in this construction.

2. Casting with an all-plastic construction with or without a foamed core. The casting resin can be foamed so that it expands to about five times its original volume. These foaming characteristics can be utilized to produce a permanent core as shown in Fig. 4. Patent applications have been made on a number of these processes involving the foamed core. However, in many instances a cross-ribbed solid plastic cast has been constructed instead of the foamed core construction, which especially with the aforementioned new resin, has proven adequate. If the latter construction is used, cores are inserted and removed after the casting is set. The applications used are similar to the ones

Fig. 4. Cross-section of a foamed core.



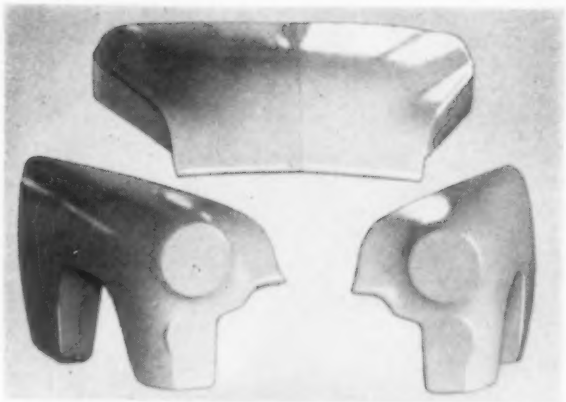


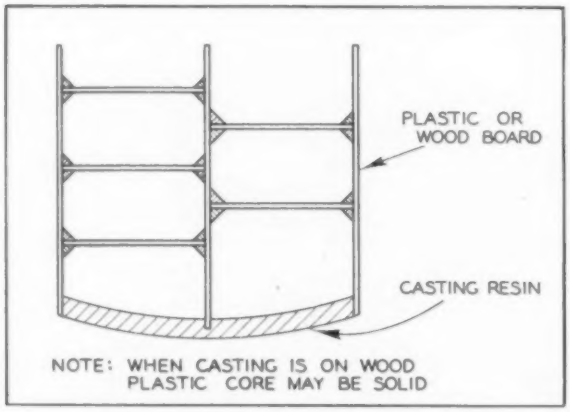
Fig. 5. All-plastic cast pieces from resin.

mentioned above. The recorded accuracies are spotty but indicate results well within ± 0.010 in. in pieces of 48 in.-dimensions. Thickness of plastic is approximately the same as above. Fig. 5 shows some all-plastic pieces.

3. Casting using a wood or plastic frame. Fig. 6 shows the general alignment of a fixture where the egg-crate frame, of either wood or sheet plastic, is used. In some instances solid wood blocks have been substituted for the egg-crate lattice work. The fixtures containing wood backing either in frame or solid form are now used almost exclusively for spotting frame pieces, since it was found that the change in the wood often caused changes in the comparatively thin coat (approximately ½ in.) used in these pieces, with resulting inaccuracies or crazing or cracking. The plastic board construction is now used for spotting block and other applications, but no accurate or reliable records are available. Reports indicate that when properly manufactured, these constructions present a good low-cost tooling aid usable without fear of inaccuracy over a short range period.

In the aircraft industry the primary application has been in making stretch press blocks and hydropress forms and also to make drill jigs and nesting fixtures. For the first two items, all-plastic construction with cross-ribbing as described above is used extensively. The important consideration here is assurance of adequate thickness of plastic on the stretching or other contacting surface to insure enough strength to withstand the several thousand tons generally encountered in this type of work. For drill jigs a laminated construction involving the use of Fiberglas mat or cloth has found widespread and generally accepted use. This forms a very light-weight fixture which can be handled adequately by women often employed for these operations. Another application recently developed is one where sections of the fuselage are reproduced in all-plastic spotting frames for checking the metal dies used in the presses.

Fig. 6. Diagram of an egg-crate type of frame.



Recent uses developed in conjunction with the forging industry include the use of Keller or other duplicate masters for sinking forging dies. Many prime or other central contract holders make duplicate Kellers which are sent to their subcontractors to speed construction of the die. Naturally these masters, due to their permanency and shape stability over a long period of time, can be used for reworking the die after it is worn out. Also the material has been used for checking the die cavity and checking the resultant cast for accuracy. In this application the smooth and accurate reproduction has proven more attractive than the conventional comparatively low-melting metals. Investigations are now under way which will utilize a solid block of plastic and shape it to templates so that the plastic part would replace a steel master.

In foundry applications the use in match plates and core boxes has proven satisfactory because of lighter weight and of often lower cost of manufacture and maintainance. The abrasion resistance to sand is at least equal or better than aluminum. Core boxes for making plaster parts in the process for casting torque converter drives have been used successfully.

The outstanding cost reduction is in the time savings possible by the use of casting resin. In the program referred to above, which eliminates the use of mahogany models, the manufacturer reported a saving in time in excess of three months. Other tooling programs involving the use of plastics have shown similar reductions in tooling time.

The actual cost is about 25 to 35 percent less for a plastic duplicate master model as compared with a second mahogany master. For spotting masters and checking gages, the kind of construction used and the accuracy required will be the indicative factors.

Credits

Banner Die Fixture Co.
Bourdeaux Pattern Co.
Guardian Engineering and Manufacturing Co.
Warren Plastics and Engineering Co.

Nomograph for Determining Centrifugal Force

By Leonard M. Majeske
REGISTERED ENGINEER

MACHINE DESIGNERS are frequently confronted with the problem of calculating the centrifugal force that exists on governors, unbalanced shafts, etc. A convenient nomograph is presented below in terms of the more commonly used units of inches, pounds, and rpm.

The range of the nomograph may be extended by a simple manipulation of decimal points.

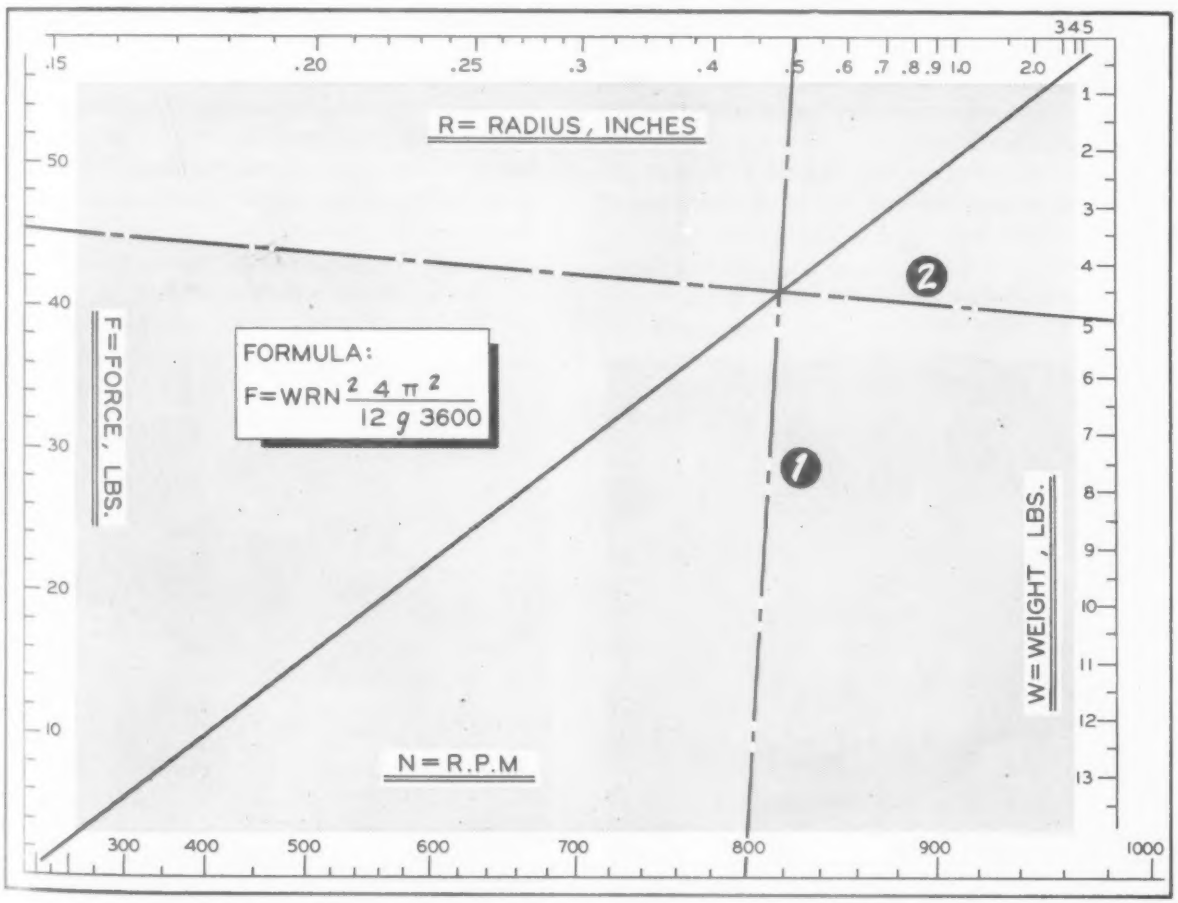
The example illustrated is as follows:

Problem:

Determine the centrifugal force on a weight of 5.0 lb rotating at 800 rpm at a radius of 0.5 in. from the axis.

Solution:

Draw line (1) connecting $R = 0.5$ with $N = 800$. From the point $W = 5.0$, draw line (2) through the intersection on the diagonal and extend it to intersect the force scale at $F = 45.5$ lb.



Metal Stitching Speeds Assembly, Reduces Cost

By Arthur G. Denne

MANAGER, ROUND STITCHING WIRE DEPARTMENT
ACME STEEL COMPANY

Part I

METAL STITCHING, regarded by the automotive and aircraft industries as the quickest and cheapest attachment method, joins thin-section metals and non-metals at production rates without pre-cleaning, drilling, punching or hole alignment. Stitches are formed in one-fifth of a second and have high strength and durability. Wire cost is less than 1½¢ per hundred stitches.

In comparison with conventional joining methods, metal stitching makes possible production increases of up to 700 percent, material savings of up to 50 percent and eliminates many costly operations requiring skilled workers.

Material costs have been reduced approximately 95 percent at the Mission Appliance Corp., Hawthorne, California by replacing sheet-metal drive screws with metal stitches in the manufacture of its air heaters. See Fig. 1.

Formerly, 32 screws were applied to the unit by hand with a screw driver. Now, a similar number of metal stitches are applied semi-automatically with a power-driven metal-stitching machine. Material costs of the screws necessary for one assembly cost $0.0787. The cost of the same number of metal stitches is $0.0033. In addition, 3½ man-hours per day are now saved.

The Holland Furnace Co., Holland, Michigan, has achieved a labor saving of 82 percent, a material saving of 67 percent and has increased their production 6½ times by replacing riveting with metal stitching in the assembly of asbestos cloth to a steel frame as shown in Fig. 2. In this application, the stitch passes through and joins three layers of material—steel, asbestos and steel.

Metal stitches have high shear and tensile strengths and are resistant to fatigue and vibration. They are formed of high-tensile-strength steel wire. The fact that they form their own holes as they are driven eliminates the pre-punching and drilling operations necessary when joining components by

Fig. 1. Assembling an air heater duct with a metal stitcher.

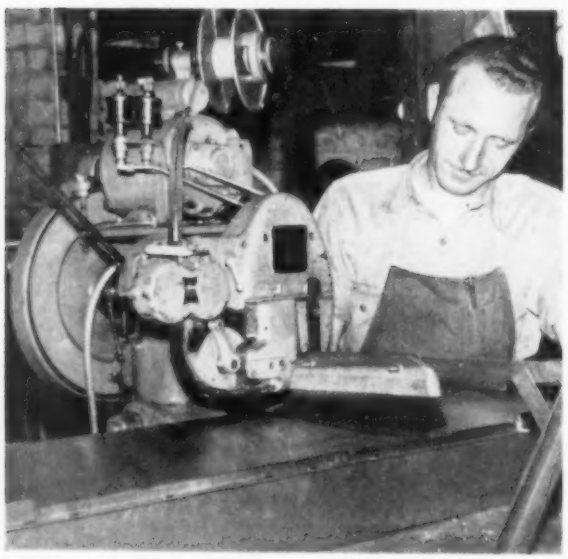


Fig. 2. Asbestos cloth is stitched to a steel frame.

riveting. Also eliminated is the time-consuming job of matching rivets to holes.

Stitching is differentiated from stapling in that stapling uses pre-formed U-shaped staples while stitching automatically feeds wire from a coil, cuts it to length, forms a wire stitch, drives it through, and clinches it.

Stapling operations are performed on either hand, foot, or power-operated stapling machines. These machines are satisfactory for small-volume jobs and very light work. Stitching operations are performed on high-speed power-driven stitching machines. Stitches are formed from continuous coils of high-carbon steel wire and can penetrate substantial thicknesses of metals and non-metals at production rates.

Components being assembled can be joined with either loop-clinched or flat-clinched stitches. Loading strengths of flat-clinched stitches are at least equal to those of rivets. The total cross-sectional area of the two legs of a single 18-gage (0.0475-in. diameter) flat-clinched stitch and the total shear loads this stitch can withstand are both approximately equal to one-third the total area and the shear load values of an 1/8-in. full-hard aluminum rivet.

At production rates, wire costs are as low as 12¢ per thousand with 7/16-in. crown stitches and 9¢ per thousand for 1/4-in. crown stitches. The crown of a stitch is the inside distance between its two legs.

Substantial material savings are possible with metal stitching because smaller flange areas are necessary with this method than with spot welding. For example, when joining 0.016-, 0.032-, and 0.015-in. sheets by spot welding, flange widths of 5/16, 7/16 and 9/16 in. respectively, are necessary. However, when joining these and other gages of material by metal stitching, flange widths can be reduced to 1/4 in.

Very little power is consumed during the stitching operation since motors of 1/3 and 1/2 hp are more than sufficient for driving stitches through the maximum recommended material thicknesses. Stitching joins metal to metals and non-metals to metals with equal ease. Dissimilar metals not readily welded, such as steel and aluminum, are very easily fastened by this method.

Metal stitching does not remove galvanized coatings as do the attachment methods utilizing heat. Materials being stitched need not be cleaned prior to joining, and stitches applied to parts that have been painted do not disturb the finished surfaces.

The various models of metal stitchers available have machine speeds ranging from 280 to 325 stitches per minute. See Fig. 3. Operating speeds are considerably lower than machine speeds because of the time consumed in setting up and positioning the work. On most production applications, operating speeds from 80 to 100 stitches per minute are attained. As the time for set-up and positioning is diminished, operating speed approaches machine speed.

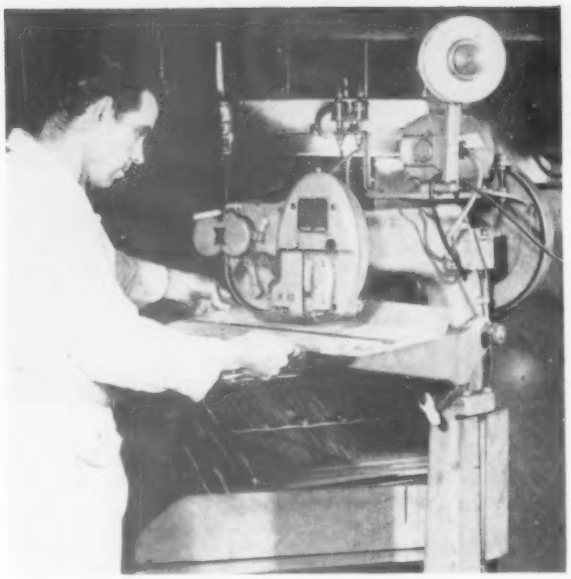


Fig. 3. Typical metal stitching machine.

Metal stitching is currently in use joining nonmetallic materials such as canvas, rubber, plywood, leather, cardboard, asbestos, twisted paper and felt to the full range of metals including aluminum, steel, brass, copper and stainless steel in the manufacture of automobiles, busses, trucks, refrigerators, electric ranges, furnaces, toys, novelties, aircraft, metal furniture and other items.

The metal-stitching technique as it is known today is an extension of the methods designed for box stitching and book binding. Metal-stitching machines are special adaptations of box-making and book-binding stitchers. In the mid 1930's one of the automobile companies began stitching garnish molding to window frames. As the wood used in automobiles was replaced by steel, cardboard tacking strips for the attachment of upholstery were held in place by welding steel tabs to the body. When it was found that these tacking strips could be successfully attached to the sheet metal on book-stitching machines, a contract was let for the development of a special machine for this purpose.

The machine that evolved was the first metal stitcher. It was one of a number manufactured and delivered to this automotive company in 1938. Approximately $60,000 was saved during the first year the company used these machines for fastening tacking strips to steel. At present, metal-stitching machines are used by all of the major automobile manufacturers.

A unique installation in this industry is an upside-down version of the N2A-20 Acme-Morrison

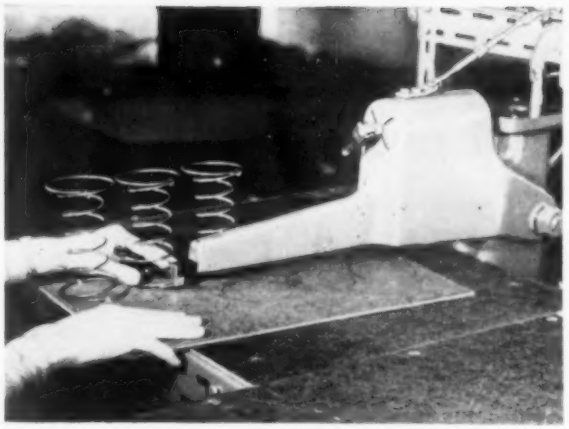


Fig. 4. A metal stitching machine is shown fastening automobile seat coils to a Masonite panel.

machine for stitching coil springs to Masonite panels. This is in contrast with conventional manufacture of cushion and back seating units in which springs are fastened to stamped-steel seat frames, and effects a 25-percent saving of steel.

Printed circles on the board speed coil positioning. Each coil is fastened to the Masonite panel with two by-pass clinched metal stitches. See Fig. 4. The legs of these stitches are forced through the Presdwood, wrapped around the spring, and returned to touch the board.

Stitches are automatically cut to length, formed, driven and clinched in approximately 1/5 second. If setup and positioning took no time at all, the machine could operate at a rate of 280 stitches per min. However, depending upon the operator, the total time for positioning and stitching the 48 coils to the seat panel ranges from 3 to 5 min. Material cost of the 96 stitches needed to fasten these coils is 1¢.

In 1941 stitching machines were first used experimentally in aircraft production. The stitching machines developed for the Bell Aircraft Corp. formed flat-clinched stitches instead of the standard loop-clinched stitches. These stitches have higher ultimate strengths and can withstand aircraft vibration more effectively than standard stitches.

Flat-clinched stitches have legs that lie flat against the bottom of the work. After the legs of these stitches penetrate the work, a moving clincher cammed from the drive shaft is forced upward to press the legs flat against the bottom layer of material.

Examination of parts taken from airplanes that have seen extensive service in both the arctic and the tropics reveals that the stitches successfully resisted both corrosion and vibration. See Fig. 5.

Because the punching action is a clean one, notch effects that might lead to fatigue failure or cracking of the sheet under severe vibration are eliminated. In controlled tests, stitched joints have withstood 100 hours of vibration. Authorization to use stitches in the manufacture of structural and non-structural components was granted by The U. S. Air Force in 1943.

Wire Specifications

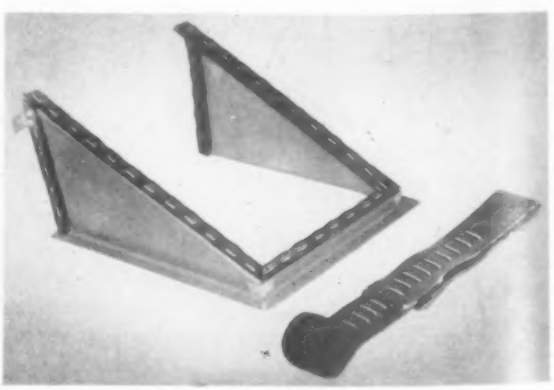
The stitching wire in common use falls into three Washburn & Moen sizes: 16-gage, or 0.0625-in. diameter; 18-gage, or 0.0475-in. diameter; and 20-gage, or 0.0348-in. diameter. Tolerances on these wire diameters are to plus and minus 0.001 in. and the wire is not more than 0.001 in. out of round. More than 98 percent of all applications use the 18-gage wire. Of the remainder, 1.5 percent use the 20-gage wire and approximately 0.05 percent use the 16-gage wire.

Four nominal grades of high-carbon stitching wire are available: 230,000, 260,000, 290,000, and 330,000 psi. All are cold-drawn or cold-rolled steel. The first has a tensile strength range of from 220,000 to 249,000 psi; the second, from 250,000 to 289,000 psi, the third, from 290,000 to 319,000 psi; and the fourth, from 320,000 to 360,000 psi. All sizes and grades can withstand 180-deg bends without fracturing or breaking.

Available standard commercial finishes include: tin, galvanized, liquor, or bright finish. A highly corrosion-resistant zinc-coated wire is used for aircraft, or other applications where this quality is required. This wire is made from basic 18-gage AISI-1086-grade steel wire having a tensile strength of 290,000 to 330,000 psi. It has a 0.00125-in. coating of zinc that can withstand a 300-hr salt-spray test to meet military specification AN-W-13.

For special applications, phosphor bronze, stainless steel, and monel stitching wire is used. The phosphor bronze wire most commonly used is 18-gage type S-54. The stainless type most commonly used is AISI-302 and is available in tensile strengths of 163,000 and 230,000 psi.

Fig. 5. Airplane components secured with metal stitchers show no effects from corrosion or vibration after service tests under severe conditions.



Machine Tool Origins

By Gilbert S. Schaller

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Part I

MATERIAL CIVILIZATION has advanced in cadence with the development of its mechanical progress. It is extremely difficult, if not impossible, to trace an accurate chronology of mechanical progress, since records of early achievement are incomplete and, in many cases, unreliable and contradictory. This state of affairs arises, in part at least, from the fact that ingenuity and inventiveness were not, nor are they now, the exclusive possession of any one country or people. In consequence, the history of mechanical progress is slanted in the direction of those peoples, nations, or regions whose historical writings have been of sufficient moment to cause their preservation.

The Slitting Mill

The origin of the slitting mill will serve as an example of the contradictions that surround most mechanical developments and inventions. Coleridge[1] states that Foley, a fiddler living near Stourbridge, worked his passage to Sweden in secret for the purpose of seeking out the construction and operation of the slitting mill that was in successful operation for making nail bars. He is said to have gained admittance to the Swedish mill by posing as an itinerant fiddler entertaining the workers, whose confidence he readily gained. Upon feeling that he had mastered the construction of the slitting mill, he re-appeared in England where he secured sufficient financial support to enable him to construct a mill. Its operation proved to be a failure; whereupon he again secretly took leave and re-visited the Swedish mill, and succeeded in learning the cause of his mill's failure.

He returned to England and persevered with his objective until his efforts were rewarded by seeing his mill prove successful. This source further credits Foley's achievement as being so rewarding that he became personally rich and a benefactor to his countrymen.

The above account, however, is but one version of Foley's activities in connection with developing the slitting mill in England. A second version[2] alleges that Richard Foley was a nailer who made his way to Holland where he maintained himself by begging and playing the flute. In the guise of a mendicant, he is said to have visited the slitting mill and learned its construction. Upon his return to England, a mill was built with financial assistance from some monied people. When the mill failed in operation, he revisited Holland only to discover that he had failed to provide cooling water on the slitting rolls. When he returned to England and included this feature in his slitting mill, operation was successful to the point that he built and endowed a hospital.

The point to be made from these conflicting accounts is that nothing is positively known relative to the origin of the slitting mill. Did it originate in Sweden or Holland, or was it born elsewhere? There is, in fact, an account in Shaw's "History of Staffordshire" to the effect that one Brindley went to Germany and brought back the idea for the slitting mill. It obviously was not invented in England; yet that country developed it to the point where a substantial iron rolling industry was based upon it.

It is impossible to assess the influence of the slitting mill on successive mill development; yet, in the French Encyclopedia[3] there are splendid plates showing a slitting mill, furnaces, and buildings, indicating that the French also contributed in a major way toward the development of present-day rolling mill equipment. It is interesting to speculate about developments of rolling and slitting mills in other European countries whose archives have been destroyed or are closed to investigators. No doubt, additional information of interest would be forthcoming.

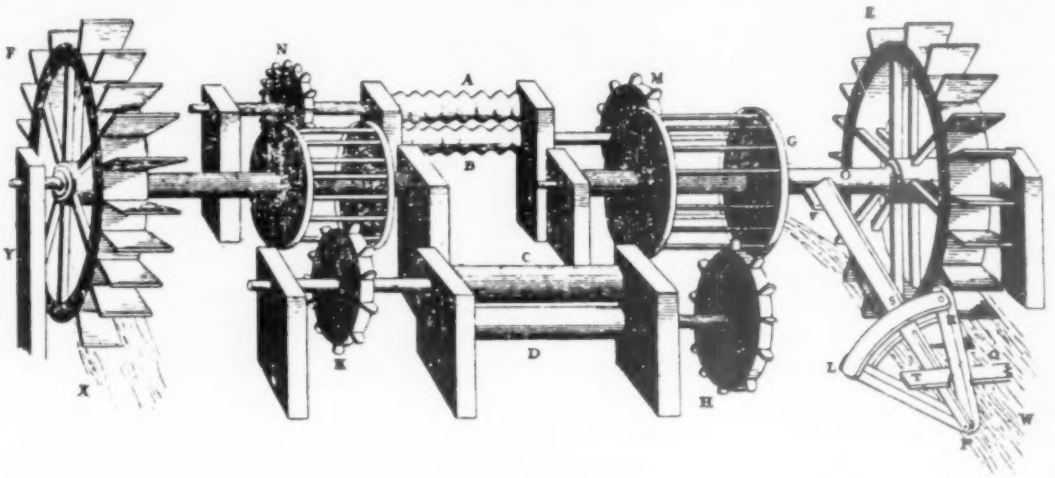
Machine Tool Components

The instances just cited may be regarded as typical of many devices and contrivances related to mechanical engineering and especially to the origin of machine tools. A machine tool is, in effect, a

[1] *Letters, Conversations, and Recollections of S. T. Coleridge, Esq.*, 1836, Vol. II, p. 129.

[2] *Playfair, British Antiquities*, 1809, Vol. II, p. 217.

[3] *Encyclopedia ou Dictionnaire Raisonné des Sciences, des Arts, et des Métiers*, 1751-65.



A Mill for Iron Work, 1758, From Emerson's *Mechanic's*

From the *Collected Papers of Rhys Jenkins*, the Newcomen Society, Cambridge.

AB, the slitting mill; CD, the plate mill; SP, the clipping mill; E, F, two great water wheels. After the water has passed the wheel, E, moving in direction QW, it comes about to the wheel, F, in direction XY. Water wheel E with lantern G on the same axis, carries the spur wheels, M and H, with the cylinders, B and D, and wheel F with the lantern, I, carries wheels N and K with the cylinders, A and C. The cylinders, A and B, as also C and D, run contrary ways about and the cylinders A and B are cut into teeth for slitting iron bars. C and D are eight inches in diameter, A and B, about 12; and these cylinders may be taken out and others put in and may be brought nearer to or farther from one another by help of screws which screw up the sockets where the axles run. The axles of N, I and K lie all in one horizontal plane and so do M, G, and H, but the cylinders, A and B, and also C and D, lie one above another.

For making the plates: if a bar of iron be heated and made thin at the end, and that end put in between the cylinders, C and D, whilst the mill is going, the motion of the cylinders draws it through on the other side into a thin plate. Likewise, a bar of iron being heated and thinned at the end, and put in between the two cylinders, A and B, is drawn through on the other side, and slit into several pieces or strings. And then, if there be occasion, any of these strings may be put through the plate mill with the same heat and made into plates.

OPQ is the shears for clipping bars of cold iron into lengths. V, a cog in the axis of the water wheel. OP, one side of the shears made of steel movable about P. The plane, LPR, is perpendicular to the horizon. When the mill goes about, the cog, V, raises the side, OP, which, as it rises, clips the bar, TQ, into two, by the edges, SP and RP. All the engine except the water wheels, E and F, is within the housing.

composite of several basic ideas extended to include a further function or, as often happens, a varient of the original design accomplished by using a different approach. Proof of this can be had through even casually examining engine lathes offered by competitive manufacturers.

There are, for instance, conflicting claims relating to the origin of the slide rest. The French encyclopedia of 1772, and even an earlier edition, shows details of the slide rest. However, several others, among whom were Bramah in England and Sylvanus Brown in America, are credited with this invention despite the fact that a patent on this device was issued in 1798 to David Wilkinson of Pawtucket, R.I.[4] In the face of this evidence, the invention of the slide rest is considered to be the work of Henry Maudslay of London, since it is known that he designed and built it so expertly that those currently in use are regarded as descendents of his handiwork.

Even though the origin of the slide rest is unsettled, there are other devices of just as great significance, in their own right, whose originators have been forgotten or were never known. One such contrivance is the tight and loose pulley. Its applications are legion and, until the advent of the clutch, the device was a basic part of every machine tool. It is known that tight and loose pulley drives were used in England late in the eighteenth century and that they appeared on lathe headstocks early in the next century.

The crowned pulley is another far-reaching development whose originator is unknown. There are drawing showing crowned pulleys used in conjunction with the tight and loose pair as early as 1802. Connop's specifications written in that year call fo

[4] *History of Pawtucket*, Goodrich, 1876.

both pulleys of the pair to be crowned.[5] Certainly the concept of crowned pulleys as well as tight and loose pairs has been an accepted fact without any thought having been given to their origin. In light of this, perhaps too much controversy surrounds the origin of other machine tool components about whose inventors something is known. Yet we in engineering manufacture should not be too willing to overlook these personages and events lest our indifference be interpreted as apathy.

Machine Tool Definition

There are many references in the literature to mechanical devices extending through the centuries. In order, therefore, to avoid confusion as between a power-driven mechanical device and a machine tool, it seems desirable to define the latter so that it can be classified among power-driven equipment. The Machine Tool Builders' Association[6] defines a machine tool as "a power-driven, complete metal-working machine not portable by hand, used to remove metal in the form of chips". This definition can be re-stated to read, "a machine tool is a power-driven machine used for shaping metal by cutting". Its two important features are the use of power and the formation of chips from the base metal.

Mention of the use of power will tend to date the machine tool as having been originated subsequent to Watt's invention of the steam engine about 1770. Any such concept is inaccurate since water was rather generally applied as a power source prior to that date. In fact there are drawings extant of John Payne's human-power engine dating to 1573 and the foot mill (tread mill) is sketched as operating in 1561.[7] Other power sources included the hand crank and foot treadle.

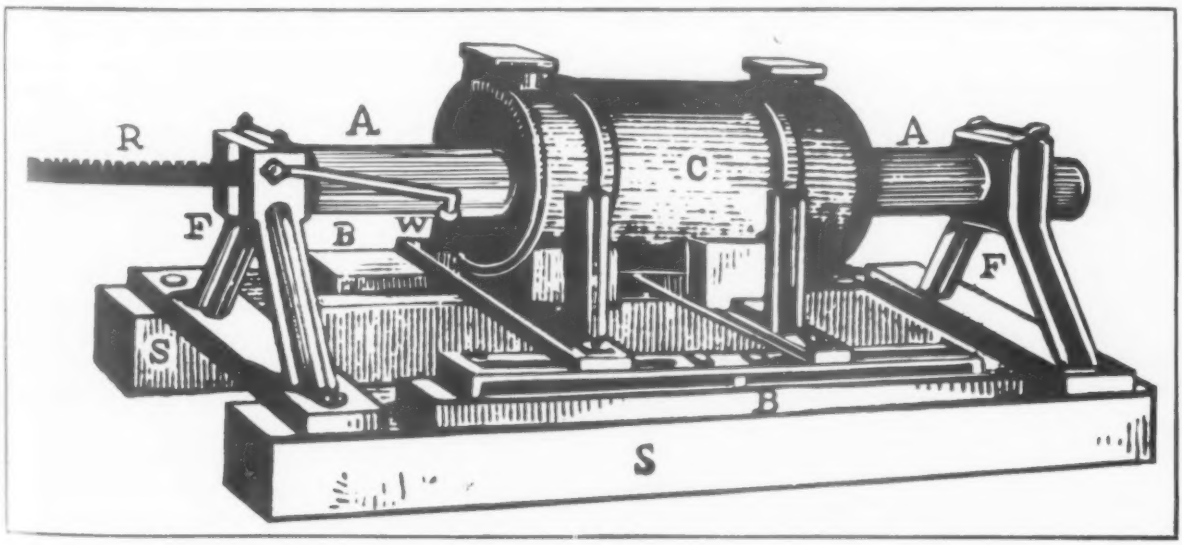
[5]*The Engineer*, Apr. 12, 1918.
[6]The National Machine Tool Builders' Association, Cleveland, Ohio.

It is an extraordinary circumstance that finds a machine tool making Watt's steam engine a possibility. His problem was primarily that of providing a cylinder of sufficient truth in order to prevent excessive leakage around the piston. One historian describes this difficulty and Watt's expedients thus, "He wrapped it around with cork, oiled rags, tow, old hats, paper, and other things, but still there were open spaces left, sufficient to let the air in and the steam out".[8] A further indication of this difficulty can be gained from Watt's statement that "at the worst place the long diameter exceeded the short by three-eighths of an inch in an 18-in. diameter cylinder". Smeaton,[9] who had designed a boring mill in 1769 for machining cannon, reported to the Society of Engineers upon seeing Watt's first engine that "neither the tools nor the workmen existed that could manufacture so complex a machine with sufficient precision".

There was neither equipment nor method for boring Watt's first steam engine cylinder with the result that it had to be fashioned by hammering. John Wilkinson, in 1774, conceived the idea of a boring mill, constructed in a manner whereby the boring bar was provided with a support at its outer end as shown in Fig. 1. This boring machine was built on an oak frame, a common practice in all early machinery construction. None the less, the boring machine was successful to the extent that Boulton[10] wrote in 1776, "Mr. Wilkinson has bored us several cylinders almost without error; that of 50 in. in diameter, which we have put up at Lipton, does not err the thickness of an old shilling in any

[7]*The Collected Papers of Rhys Jenkins*, Newcomen Society Publication, Cambridge, 1936.
[8]Boulton & Watt, Smiles, London, 1904.
[9]*English and American Tool Builders*, J. H. Roe, 1916, Yale University Press.
[10]Treatise on Steam Engines, Farey, 1827.

Fig. 1. Wilkinson's boring mill.
From *The Coming of the Machine Tool Age*. F. W. Geier



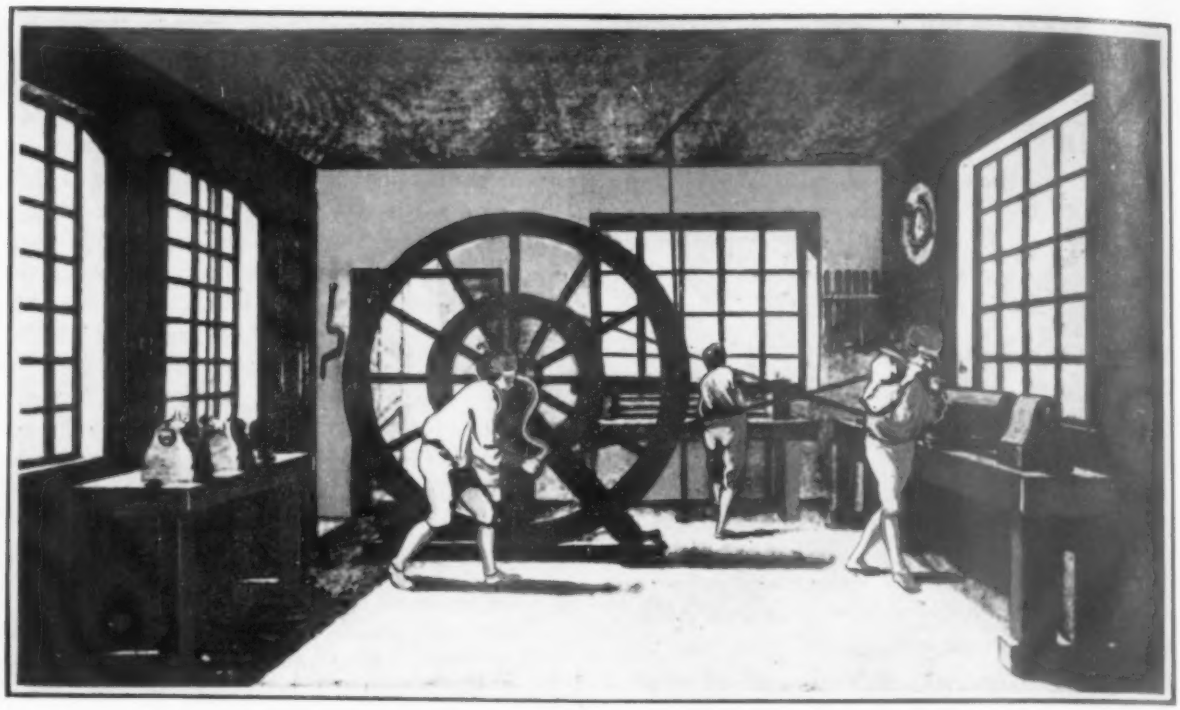


Fig. 2. Early French lathe powered manually.
From *English and American Tool Builders*, Yale University Press, Joseph W. Roe.

part". Obviously, Wilkinson's boring mill was such an outstanding achievement that it can well be ranked as an epic in the history of machine tool development.

It is interesting to note that a machine tool made the steam engine possible. This event is a harbinger of the subsequent story of machine tools. Each new requirement has been met successfully by the machine tool industry from Wilkinson's boring mill to present-day transfer machine tools.

The Lathe

There is no authentic record of the first machine tool although the lathe has received most mention in early writings. This is a natural development since that machine tool has always been prominent and used in greater numbers throughout the metal-working industries than any other one.

The first ones of record were known as "pole" lathes. They were constructed to operate as the result of combined action of a foot treadle and a pole or sapling fastened to the ceiling. A line from the treadle was passed around the workpiece in several turns and the other end attached to the pole. By depressing the treadle, the work made several revolutions while, at the same time, the pole was deflected; at the end of the treadle travel, the pole was sufficiently bent to cause its springing action to bring the treadle back to position but, in the process, the workpiece was rotated in reverse. In consequence, alternate rotation was imparted to the work thereby permitting the operator to use a hand tool thereon only on the forward part of the rotation cycle.

There is pictorial evidence that the French developed lathes on which the workpiece rotated in the same direction continuously. Lathes of this design were frequently driven by a belt whose source of power was a hand crank attached to a pulley and flywheel. The important components of the lathe were fashioned from wood due to its ease of forming as pictured in Fig. 2.

The French had also built lathes for turning ovals as early as 1772. There seems to be ample evidence that the French were the leading mechanics of the eighteenth century. Many of their inventions remained static and were developed only as a result of the efforts of English and American machine tool builders. Roe[11] described and illustrated screw-cutting lathes built by the French in 1569 and 1740. The latter illustrates the beginning of the use of the lead screw and change gears.

It remained for Maudslay to build an engine lathe around the year 1800 that was far in advance of any such machine at that date. Maudslay's lathe featured a cast iron bed and a 30-pitch lead screw together with a follower rest and change gears. This lathe was equipped for manual power by providing a wheel not unlike in appearance to a ship's steering wheel with hand-holds outside and normal to the rim. Maudslay built a lathe with a face plate 9 feet in diameter on which he bored cylinders as great as 10 feet in diameter about the year 1825.

[11] *English and American Tool Builders*, Yale University Press, 1916.

Centrifugal Steel Casting in Permanent Molds

By John Osborn Felt

LEBANON STEEL FOUNDRY

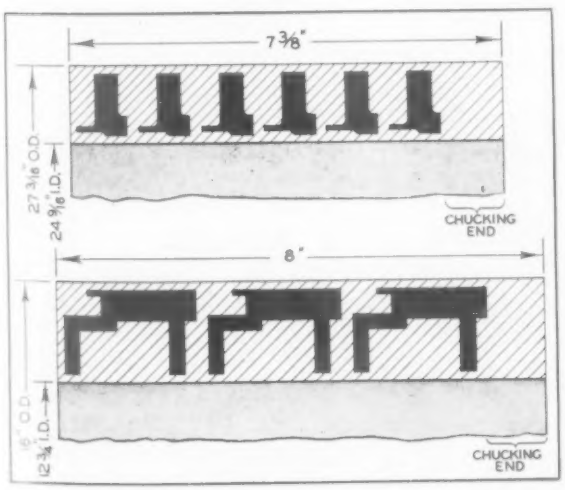
Part II

AT THE PRESENT STAGE of development, centrifugal castings approximate a cylindrical shape. However, flanged rings or bushings can be cast by this method. Variations in the desired cross-section are achieved by machining the rough cylindrical casting. It is common practice to machine a number of rings from each casting or cylinder blank, as shown in Fig. 2. Jet engine components which can be produced in this economical way include turbine shroud rings, turbine labyrinth seals, support rings, outer nozzle rings, nozzle guide-vane support rings and turbine stator rings.

Producing multiple parts from a single blank also is customary to achieve metal conservation and reduce machining time. Similarly, uniformity of metal structure can be obtained in intricate cross-sections, as shown in a cross-sectional view of a centrifugal casting blank in Fig. 2.

Many variations in diameter, thickness and length of heat-resistant rings centrifugally cast in permanent metal molds can be obtained. Facilities at Lebanon Steel Foundry currently are capable of producing cylinders or Centri-Die blanks up to approximately 42 in. in diameter and up to approximately two feet in length, depending upon the diameter. Castings are made in either vertical- or horizontal-axis machines.

Fig. 2. (top) Cross-sections of rings used in jet engines show economy of cutting multiple rings from one blank; (bottom) Uniformity of metal structure can be obtained in intricate cross-sections when grouped like this to conserve metal.



Machines Limit Size

There are, in reality, no exact limitations on the size or weight of the centrifugally cast parts. Present limitations are based on the size of machines and melting units and the type of alloy under consideration. At the present time, the maximum lengths, with up to a 14-in. diameter, might be two feet.

As indicated, many materials can be centrifugally cast in this way, but the process is especially adaptable to alloys capable of withstanding the heat, centrifugal forces, thermal stresses, corrosion and vibration encountered in aircraft gas turbines. One austenitic, heat-resisting steel is cast in shapes as large as 36 in. in diameter and weighing more than 500 lb.

From such cylinder blanks, either in the form of wide-diameter rings or lengthier tubing of small diameter, separate rough rings are cut on specially-built rotary cold saws, Fig. 3, and subsequently machined into the rings required in turbo-jet engine construction. These components have been successfully employed in the Pratt & Whitney Aircraft "Turbo-Wasp", the U. S. counterpart of the British "Nene", and several other American-made jet engines of advanced design.

Specially-designed centrifugal casting equipment is employed in the Centri-Die process at Lebanon. Three of the machines are of the vertical type in which variations in bore size from top to bottom of the casting can be controlled by varying the speed of rotation; two are of the horizontal type.

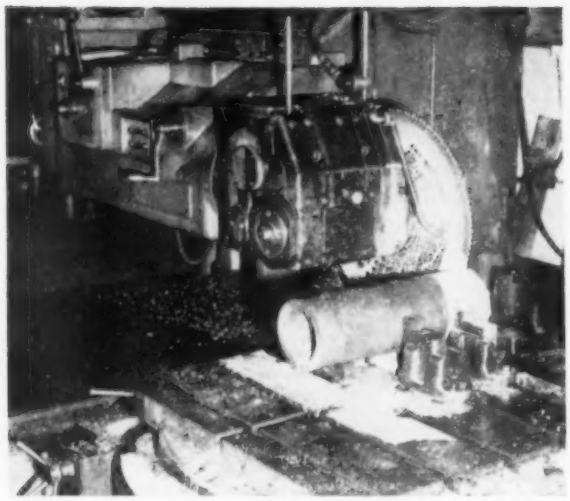


Fig. 3. Specially-built rotary cold saw cuts separate circular sections from a centrifugally cast tube. The original high alloy casting was produced in a vertical spinning machine.

One of the latter is capable of spinning a combined load of 10,000 lb (molten metal plus die weights) at a maximum speed of 1200 rpm. All machines are equipped with electronically-controlled speed regulation, insuring maintenance of desired speed of rotation within two percent.

Permanent metal molds used in this process are made from specially-developed steels, while the choice of die material depends upon the casting shape, the material from which it is to be made, and the melting temperature. The metal dies, incidentally, offer several advantages over refractory materials, a major consideration being that possibility of mold erosion is eliminated and casting grain size is generally smaller because of rapid cooling.

After mounting the ring-shaped dies, conditioning by preheating and spraying, and other preparation of the machine, the metal to be centrifugally cast is melted in one of four 1000-lb Ajax-Northrup tilting type induction furnaces. A molten charge of uniform, closely-controlled alloy is poured from each furnace, approximately once an hour. The melting temperature, which varies with the alloy employed, is controlled within a narrow range.

Because the eventual casting's bore diameter depends on the amount of molten metal poured into the die, the weight of the metal charge is closely controlled to approximate that of the specified ring. The weighed charge is poured into the rotating die of the spinning machine, as shown in Fig. 4, with speed of rotation, dependent on the design and size of the casting, varying from 100 to 1200 rpm.

The poured casting is spun from three to five minutes until solidification is complete, and is allowed to cool for about five minutes before removal from the die.

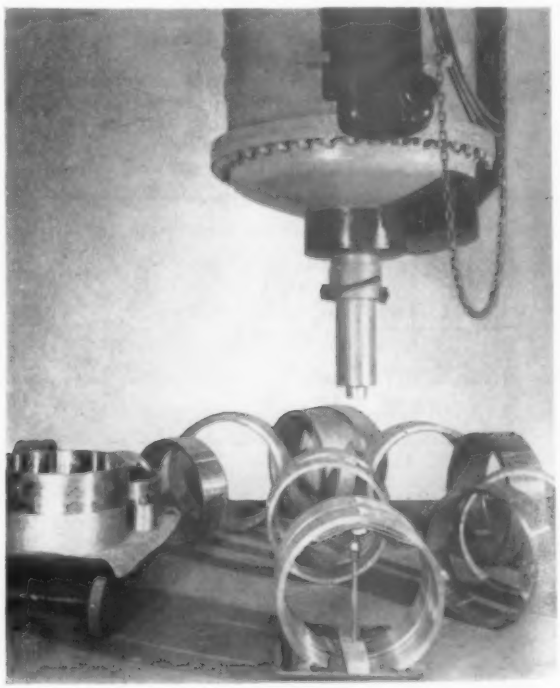
Fig. 4. Pouring a casting. Ladle laden with molten metal tapped from induction furnace is carefully weighed so that weight of metal charge closely approximates that of casting.

Inspection

Subsequently, the castings are rough machined, inside and outside, on Bullard boring mills to remove existing surface skin, and to approximate the finished size of the desired part. Any surface defects are detected by zyglo inspection. The castings are immersed in a fluorescent penetrating bath, then washed, dried, and subjected to ultra-violet (black) light, which shows any discontinuity of the metal structure. Control of all production procedure

(Continued on page 54)

Fig. 5. Inspection. A million-volt X-ray machine is used to examine centrifugal castings for internal integrity, when required.



Chrome Carbides Possess High Resistance Qualities

A NEW FAMILY of metallic carbides has been produced containing approximately 70 percent chromium, and is thus primarily a chrome carbide. It possesses physical characteristics which are in many respects superior to those of the conventional tungsten carbides.

The new metal is extremely resistant to abrasion, erosion and corrosion; is lighter than tungsten carbide; has a coefficient of thermal expansion approximately the same as that of steels; is affected very slightly by oxidation, even at high temperatures; is completely non-magnetic.

Currently in pilot plant stage of production by the Carboloy Division of the General Electric Co., chrome carbide is being used initially for making gage blocks, ring gages, plug gages and gage anvils (ribbed surface plates). In this field its success is due to its ability to resist both abrasion and corrosion, plus the fact that, since its expansion coefficient is about the same as that of steel, gaging results are not affected by air temperature variations, thus eliminating the need for correction charts.

In valves used in the petroleum industry, the substitution of chrome carbide balls for tungsten carbide balls was highly satisfactory due to lighter weight and greater resistance to abrasion, erosion, and particularly corrosion.

Corrosion Tests

Typical of corrosion tests conducted on the new material are the salt spray tests carried on at Batelle Memorial Institute. After subjecting the chrome carbide to a 30-percent salt spray for 750 hours, the test samples still retained their metallic lustre. With sulfuric acid as the corrosive agent, chrome carbide showed about 30 times the resistance of 18-8 stainless steel and three times the resistance of conventional carbides. Using nitric acid, the resistance to corrosion was approximately eight times that of other carbides, twice that of steel.

Oxidation and Erosion Tests

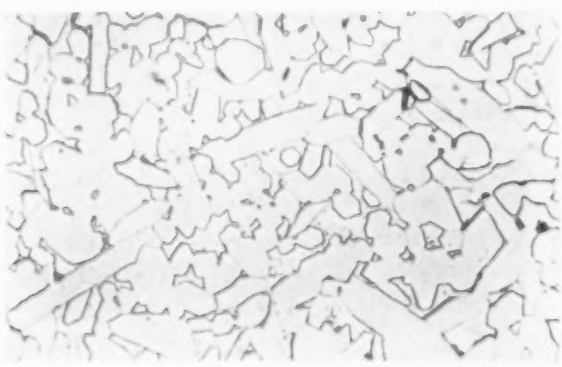
Chrome carbide seems to be almost completely resistant to oxidation at all temperatures up to 1000 deg C (1832 deg F). When subjected to a temperature of 1850 deg F for 24 hours, samples still retained their luster, while simultaneously exposed samples of stainless steel and tungsten carbide had almost disintegrated. See Fig. 1.

Erosion tests conducted with steam indicated a resistance to steam erosion approximately 50 times that of conventional carbides.

The new chrome carbides are about as machineable as tungsten carbides, and are tough enough to permit grinding without chipping or cracking. It is much harder than steel, approximately 80-93 Rockwell A. The microstructure shown in Fig. 2 is unlike that of any other metal. The grains are uniform and interlocking.

One development to be expected of the new metal is the making of complete parts of carbide rather than tipping as with tungsten carbide. It can be brazed, attached by mechanical means, or bonded by thermo-setting resins where the use of such cements is feasible.

Fig. 1. Samples of (left to right) 18-8 stainless steel, chrome carbide and tungsten carbide, all originally identical in size and shape, after exposure in air at 1850 deg F for 24 hrs. Fig. 2. This micrograph shows the interlocking characteristics and uniform grain size of chrome carbide.



Experimental Measurement of Cutting Forces and Speeds

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AND

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RESEARCH ENGINEER

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Part II

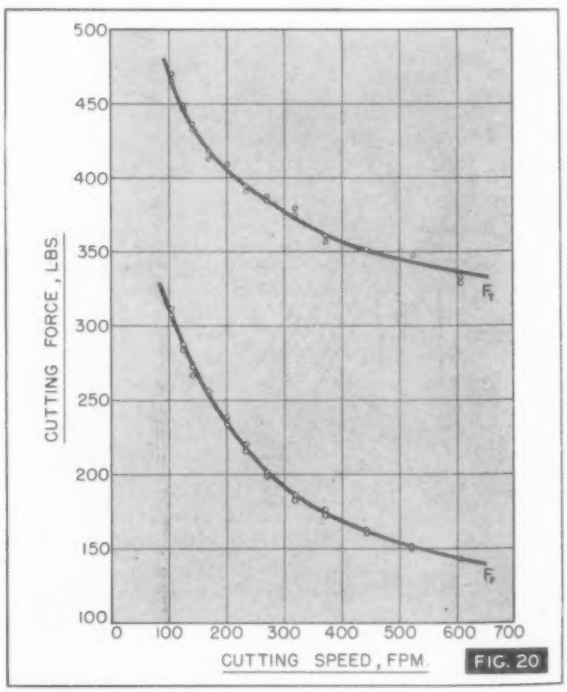
TRIGGER AND CHAO (16) have recently published measurements of tool forces at higher cutting speeds. They reported a considerable decrease in the tool forces with an increase in cutting speed between 50 and 350 fpm as shown in Fig. 20. These data were established with a two-component dynamometer in which the deflections were measured with master electrolimit gage heads. However, when the same material was tested in a milling operation, heat and power measurements made with a calorimeter showed no such decrease in the tool forces or power requirements.

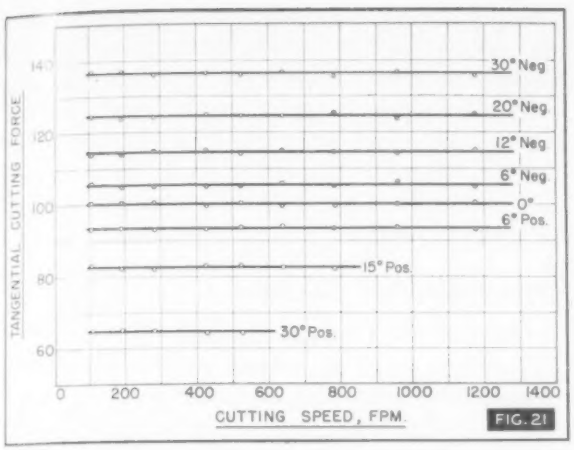
In extensive milling tests reported by Armitage and Schmidt, the power was measured accurately at low and high cutting speeds with a calorimeter (17). The evaluation of several thousand calorimetric power measurements between 100 and 1200 fpm cutting speed when milling steel showed variations of the tangential cutting forces within ± 5 percent, which were due mainly to unavoidable changes in the micro-structure of the test pieces. See Fig. 21. No marked tendency for the cutting forces to be generally lower at higher cutting speeds was exhibited. Higher cutting speeds in machine tools have often produced much better finishes and have made the operation as such appear much smoother because of less objectionable vibration and chatter, but it has never been possible to attribute a substantial reduction in power consumption to lower cutting forces at higher speeds. Usually it has been a more efficient gear train, improved motor loading, and better lubrication and operating temperature to which any horsepower reduction could be ascribed. In milling, the tool forces themselves are affected very little by the cutting speed and remain constant, for all practical purposes, as long as the tool angles are not changed by wear.

Modern machine tools are therefore designed with the rigidity and strength to withstand increased loads in all affected members. Milling machines which would permit heavy steel milling operations at very high speeds with tool forces and power requirements decreased so much as some experimental data indicate, that a lighter machine structure would be warranted, have not yet been found feasible.

From a comparison of these various diagrams it is evident that tool forces are not always constant in different types of machining. Especially in single-

Fig. 20. Effect of cutting speed on cutting forces in turning. F_T is the tangential force and F_F is the feeding force. Workpiece material—NE 9445; back rake 0 deg, side rake 4 deg, on a carbide tool with 0 deg side cutting edge; depth of cut, 0.102 in.; feed, 0.0098 ipr.





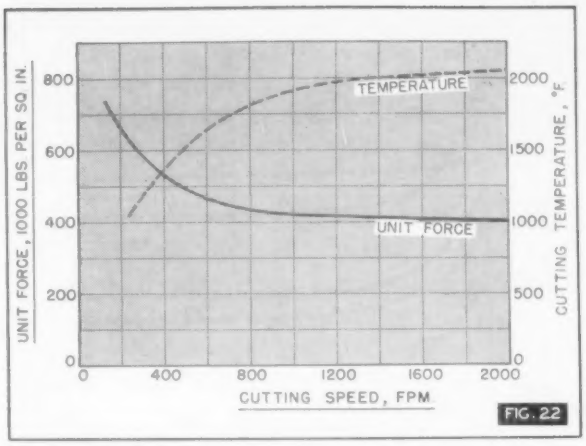


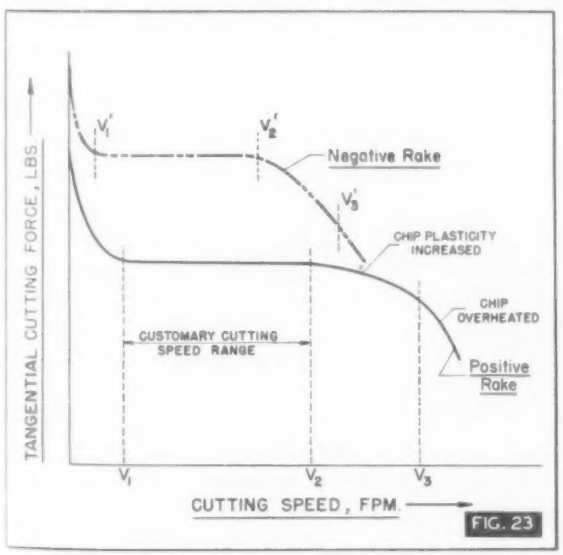
Fig. 21. (left) Cutting force—cutting speed relations for various true rake angles (based on calometric measurements when milling steel). Fig. 22 (right) Specific cutting force in steel milling using a face mill with a 10-in. diameter, 10 teeth, -7-deg rake angle; feed per tooth, 0.004 in., depth of cut, 0.200 in.

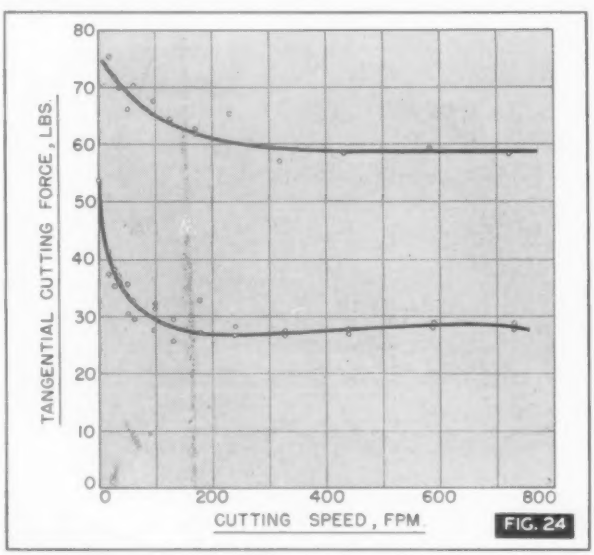
point turning there will be variations as can be seen in Fig. 1 due to the welding action between the tool and chip. Depending upon the tool and workpiece material this action can be more pronounced in single-point tools, because the tool point is in uninterrupted contact with the metal in the nascent chip at high pressures and temperatures. This welding action would be less probable in milling, since the tool is in contact with the material for only a short time and is exposed to the air or coolant for the larger part of each revolution. Tool forces in milling, therefore, should show less variation for the above reasons.

Some recent data by Duerr (18) show a very noticeable reduction of the specific cutting force, Fig. 22, when milling steel with carbide cutters of negative rake angles and increasing the cutting speed up to 2000 fpm. Milling with HSS cutters and measuring the tool forces in relation to cutting speed, Svahn (19) found a reduction of the tool forces of about 25 percent when the cutting speed was increased from 30 to 150 fpm, the greatest decrease of the tool forces occurring between 30 and 60 fpm, while between 60 and 150 fpm only a decrease of 7 to 10 percent took place.

A hypothetical diagram, Fig. 23, was published by Niedzwiedzki (20). For cutting steel with carbide tools having negative rake angles, v_1 is 150 to 210 fpm. At these low speeds welding occurs between the chip and the tool, thus causing a built-up edge. At the higher cutting speeds with decreased tool forces and shorter time of contact, there is practically no welding action or built-up edge between v_1 and v_2. When cutting with very fine feeds, negative rake angles and high cutting

Fig. 23. (left) Hypothetical diagram of tangential cutting force in relation to cutting speed. Fig. 24. (right) Force—speed characteristics when turning steel. Upper curve—depth of cut, 0.015 in.; feed, 0.025 in. Lower curve—depth of cut, 0.015 in.; feed, 0.00675 in.





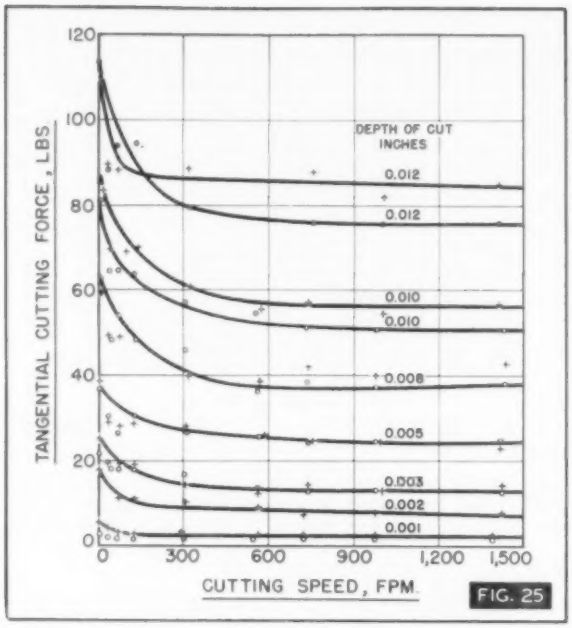
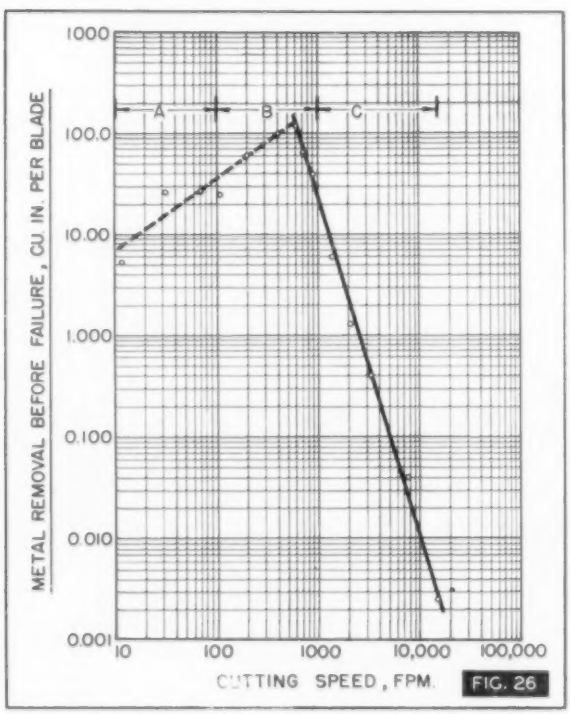


Fig. 25. Force—speed curves when turning gunmetal.

speeds as is done in finish milling steel, the quantity of heat occurring because of the separation of the chip from the workpiece is high enough to heat the chip to a red heat. This starts when v_3 is reached, the value of v_3 being lower with finer chip thicknesses.

When measuring the force-speed relation with an electromagnetic dynamometer on a lathe, Arnold (21) reported the values in Fig. 24 as typical results for turning mild steel with carbide tools having a 6-deg positive true rake. Using these same test conditions when turning gunmetal, Chisholm (21) stated that the same general characteristics as those for turning steel were observed, the tangential cutting force falling from a high value at zero cutting speeds to a substantially constant value at the higher cutting speeds. See Fig. 25.

Fig. 26. Effect of cutting speed on total amount of steel removed between grinds.



Tool Forces Not Constant

None of the previous diagrams, except Fig. 4, have shown variations of tool forces due to wear. When machining steel (22), cast iron, or any high strength alloy, the cutting edges of the tool will wear more or less rapidly. Tool wear can take place in such a way as to reduce the cutting forces temporarily during the cut, but more often entails 50 to 100 percent power increase before the tool is reground. However, effective cooling which can be provided on single-point tools and under certain conditions also on carbide milling cutters, will substantially decrease tool wear, resulting in more production between regrinds of the tool.

It is possible to heat the workpiece material and thus reduce the power required for the cut (23). But when this heating effect is obtained by the tool because of high cutting speeds, the tool itself will attain still higher temperatures, thus becoming softer and wearing faster.

Best Feeds and Speeds a Compromise

The best speed and feed for a machining operation must usually be a compromise. The highest speed and feed at which the machine tool will run smoothly, meanwhile producing a relatively large number of workpieces between tool changes, is usually the best. Feed and speed ranges as listed in handbooks and publications serve as a good starting point. Since many factors enter into any metal-cutting operation, continuous attention can eliminate those which are detrimental to good production results. The most important factors to consider are the rigidity of set-up, proper grinding of tools, increase in power due to tool wear and staying within the power capacity of the machine.

As long as machine tools provide a selection of higher cutting speeds, there will always be a tendency to use these in order to decrease machining time. This tendency has been encouraged by the improved present-day tool materials and has permitted an overall increase in production. There are often particular reasons for those instances in which cutting speeds four to five times higher than those generally recommended have been successful. For example, in milling shallow slots 0.010 in. deep and ½ in. wide in mild steel, where the chip load was very light and the teeth of an 8-in. di-

ameter cutter were in contact with the workpiece for only a short time, the best cutting speed was found to be around 2200 fpm, permitting a feed of 90 ipm. Positive rake angles and a cast-iron-cutting grade of carbide, more wear-resistant than a steel-cutting grade of carbide, were used satisfactorily under these exceptional circumstances, since the light chips did not fracture the carbide cutting edges (24).

Benefits from Higher Cutting Speeds

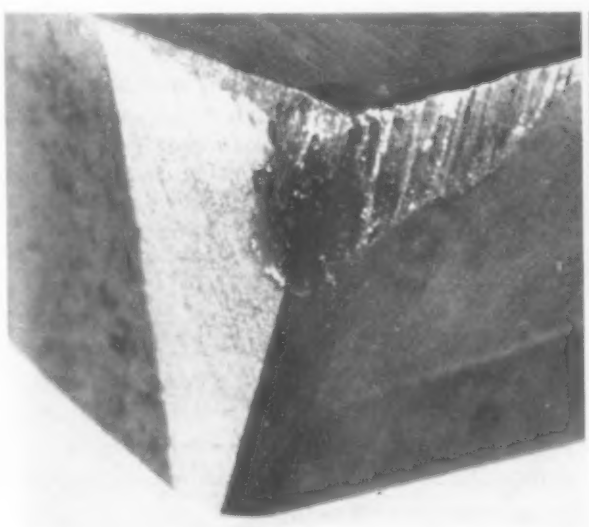
Increased rate of production and better surface finishes are first among the definite benefits attached to machining at higher cutting speeds. However, in most cases, there is a limit above which tool failure occurs very rapidly, making the operation uneconomical. To run a machine tool at high speeds with the expectation that it will remove a larger amount of metal with a decrease in the power required is, to say the least, false hope. In general, tools will fail because of continuous wear. Higher cutting speeds will increase the rate of wearing action since higher speed causes higher tool temperatures which weaken the structure of the tool material and its resistance to wear. Cutting speeds can also be too low for a particular tool material, entailing early failure because of chipping or flaking at the cutting edge.

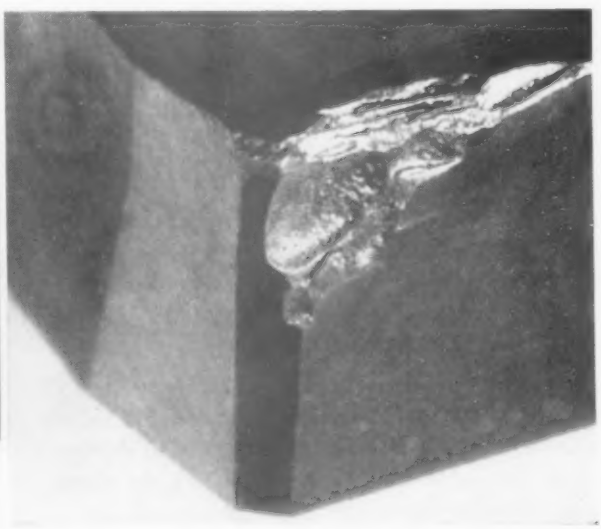
How cutting speeds affect tungsten-titanium carbide tips in milling steel is shown in Fig. 26. The type of carbide used in this test performed best at 600 fpm when milling 180 Bhn, SAE 1020, removing 120 cu. in. of material. When milling steel of 400 Bhn, the optimum cutting speed for the same type of carbide was 160 fpm. The cutter was considered dull when the wear land became $\frac{1}{32}$-in. wide. At cutting speeds above 600 fpm this criterion of wear was reached much more quickly, both from the standpoint of time and material removed. Below 300 fpm, failure occurred more often by flaking and chipping.

Tool Wear

The data used in Fig. 26 were obtained under conditions as identical as possible with regard to material, tool, size of cut, and machine. For all cutting speeds, except those below 300 fpm and above 3300 fpm, the workpiece was 4 in. wide. Tool life data at 7500 and 15,000 fpm were obtained with pieces $\frac{1}{2}$ in. wide and those data below 300 fpm were obtained using a 3-in. cutter and a workpiece $1\frac{1}{2}$ in. wide. How quickly the cutter would wear out at a 15,000-fpm cutting speed can be seen in Fig. 27. Here only one test bar was milled with an 8-in. 10-bladed cutter, and within a small fraction of a second the workpiece indicated that the cutter tips had worn so much that great increases in surface temperatures were caused. At the end of one short pass (4 in. long, $\frac{1}{2}$ in. wide, and $\frac{1}{8}$ in. deep) all 10 blades had worn $\frac{1}{16}$ in. on the periphery and on the face of cutter as shown in Fig. 27. In Fig. 28 is shown the sort of chipping that is typical at low cutting speeds. It should be kept in mind, however, that special carbide materials, which perform best at lower cutting speeds, are available; for light cuts other grades are more wear resistant at high cutting speeds. However, finer feeds will cause more rapid tool wear at all cutting speeds when using metallic carbides, due to the increased cutting temperatures.

Fig. 27. (left) Rapid deterioration of carbide tool due to excessive cutting speed. This is a typical illustration of wear in region C as shown in Fig. 26. Fig. 28. (right) Chipping of carbide tool due to low cutting speed which often occurs in region A of Fig. 26.





vary due to various physical properties of the workpiece, tool angles, machine conditions, and dimensions of the cut, higher cutting speeds will generally not save power. Higher rates of metal removal will, for practical purposes, require proportionately more power and heavier machine tools.

Other than increased rates of production, higher cutting speeds may often permit beneficial results such as decreased vibration, better gear performance, etc. In short, the machine may run more smoothly while producing, in a shorter time, more workpieces between regrinds of the cutter.

Aluminum and magnesium alloys can usually be machined at cutting speeds of 5,000 fpm and higher if carbide tools are used. The range for steels lies between 120 and 800 fpm in most cases and, generally, both the feed and speed must be reduced with an increase in hardness of the workpiece. Cast iron usually machines best at a cutting speed of between 150 and 400 fpm.

Since there is no single, definite value of cutting speed and feed for a particular material, increased production will depend on an inquisitive attitude and a willingness to try new procedures in order to improve the output of machine tools.

ACKNOWLEDGMENT

Tests carried out at Kearney & Trecker Corporation and reported herein were made with the assistance of Mr. J. R. Roubik.

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Centrifugal Castings in Permanent Molds

(Continued from page 48)

and adequate testing keep rejections at a minimum.

Production-based experience has indicated that X-ray examination is not necessary for Centri-Die castings that have been properly inspected visually, but X-ray examination to assure 100 percent internal integrity is performed in the foundry's radiographic laboratory certified by the United States Air Force (Fig. 5) when required by customer specifications.

Versatility of such steel castings is demonstrated in their use as components with welded and rolled sections in jet engines. They can be used as screwed inserts for valve seats, and can, in fact, be placed in any circular piece, whether forged or rolled.

In the important area of costs, it is significant that centrifugally cast pieces in sizes over eight in. in diameter compare favorably with forged or rolled tubing: the larger the diameter, the more economical is the process; and in alloys which cannot be forged or rolled, centrifugal casting process is more economical for all sizes.

Aside from the various jet-engine applications previously discussed, the centrifugal casting process is adaptable to the production of a variety of bushings, valve seats, pump liners and other cylindrical and circular shapes in a wide range of alloys. It offers significant possibilities for production of circular shapes required by the chemical, textile, oil, paper and pulp industries where cylindrically cast parts of heat-resistant or corrosion-resistant metals comprise an ever-expanding need.

Estimate Chart for Circular Form Tools

Blank Diameter	Below 1-3/4	1-3/4	2	2-1/4	2-1/2	2-3/4	3
Price Per Unit	$1.90	$2.00	$2.10	$2.20	$2.30	$2.50	$2.70
Price Per 1/2 Unit	$ .95	$1.00	$1.05	$1.10	$1.15	$1.25	$1.35
No. Units							
2 Min.	3.80	4.00	4.20	4.40	4.60	5.00	5.40
3	5.70	6.00	6.30	6.60	6.90	7.50	8.10
4	7.60	8.00	8.40	8.80	9.20	10.00	11.80
5	9.50	10.00	10.50	11.00	11.50	12.50	13.50
6	11.40	12.00	12.60	13.20	13.80	15.00	16.20
7	13.30	14.00	14.70	15.40	16.10	17.50	18.90
8	15.20	16.00	16.80	17.60	18.40	20.00	21.60
9	17.10	18.00	18.90	19.80	20.70	22.50	24.30
10	19.00	20.00	21.00	22.00	23.00	25.00	27.00
11	20.90	22.00	23.10	24.20	25.30	27.50	29.70
12	22.80	24.00	25.20	26.40	27.60	30.00	32.40
13	24.70	26.00	27.30	28.60	29.90	32.50	35.10
14	26.60	28.00	29.40	30.80	32.20	35.00	37.80
15	28.50	30.00	31.50	33.00	34.50	37.50	40.50
16	30.40	32.00	33.60	35.20	36.80	40.00	43.20
17	32.30	34.00	35.70	37.40	39.10	42.50	45.90
18	34.20	36.00	37.80	39.60	41.40	45.00	48.60
19	36.10	38.00	39.90	41.80	43.70	47.50	51.30
20	38.00	40.00	42.00	44.00	46.00	50.00	54.00
21	39.90	42.00	44.10	46.20	48.30	52.50	56.70
22	41.80	44.00	46.20	48.40	50.60	55.00	59.40
23	43.70	46.00	48.30	50.60	52.90	57.50	62.10
24	45.60	48.00	50.40	52.80	55.20	60.00	64.80
25	47.50	50.00	52.50	55.00	57.50	62.50	67.50

EXTRAS

Type	Add Units
Radius	1.5
Gr. Hole	1.0
C'Bore	0.5
Ratchet	2.0
Serrations	1.5
Octagon	1.5
Pin Holes	1.0
Slot	1.5
Keyway	1.5
Spec. Thd.	1.0
Nitride	1.0
Chip Breaker	2.0
Design	1.5
Special Steel	30%

QUANTITY DISCOUNT

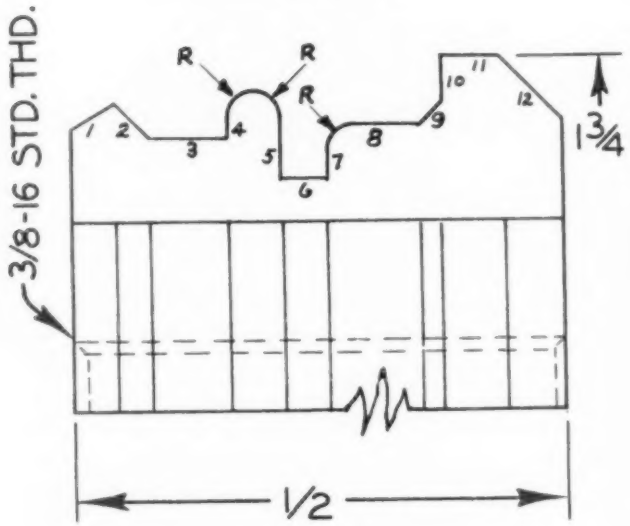
Quantity	% of 1
1	100%
2	85
3	80
4	78
5	76
6	74
8	72
10	71
12	70
18	68
24	65
50	63
100	60

Pricing Procedure for Circular Form Tools

To determine the cost of circular form tools, use the following procedure:

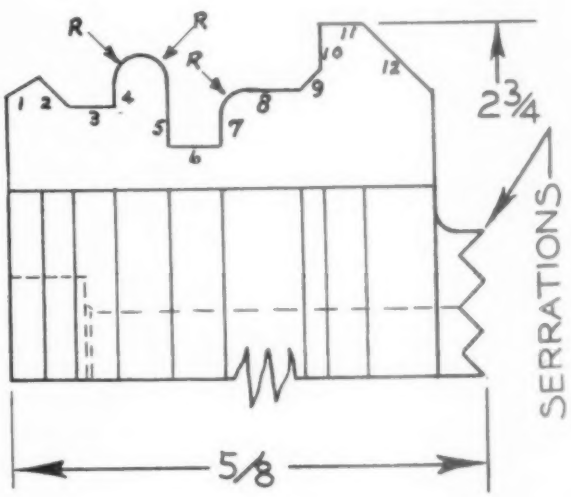
1. Determine number of units. Each vertical, horizontal, and angular face is equal to one unit.
2. Add extra units as listed on chart.
3. Refer to chart for blank diameter with corresponding number of units for total cost of one tool.
4. Multiply for quantity discount or special steel.

Example No. 1



Units	=	12.0
R,R,R.	=	4.5
Total	=	16.5
Price from chart	=	$33.00

Example No. 2



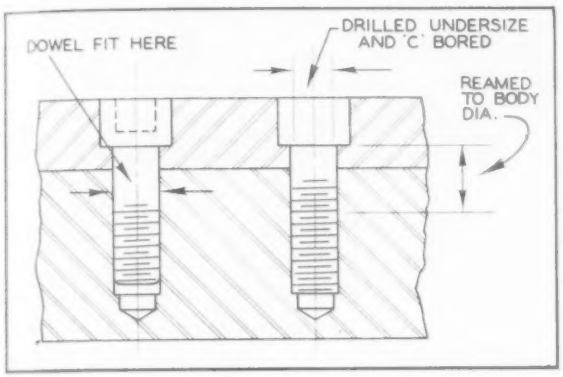
Units	=	12.0
R,R,R.	=	4.5
C'Bore	=	0.5
Hole Gr.	=	1.0
Serration	=	1.5
Total	=	19.5
Price from chart	=	$48.75

—Courtesy Morgood Tools, Inc.

Gadgets

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Screw Dowel for Fixtures



Cap screws, selected for body dia., serve as dowel pins for jigs and fixtures.

We have found that, in many instances, dowel pins in fixtures may be eliminated entirely by use of ordinary socket head screws. The main requisite is a knowledge of diameter tolerances of the screws, which the writer has tabulated for ready reference.

Screw Size	Hi	Lo	Variation
No. 8-32	0.1640	0.1613	0.0027
No. 10-24	0.1900	0.1867	0.0033
No. 12-24	0.2160	0.2127	0.0033
No. ¼-20	0.2500	0.2464	0.0036
No. 5/16-18	0.3125	0.3084	0.0041
No. ⅜-16	0.3750	0.3705	0.0045
No. 7/16-14	0.4375	0.4326	0.0049
No. ½-13	0.5000	0.4948	0.0052
No. 9/16-12	0.5625	0.5569	0.0056
No. ⅝-11	0.6250	0.6191	0.0059
No. ¾-10	0.7500	0.7436	0.0064
No. ⅞-9	0.8750	0.8680	0.0070
No. 1-8	1.0000	0.9924	0.0076
No. 1-¼-7	1.2500	1.2415	0.0085
No. 1-½-6	1.5000	1.4899	0.0101

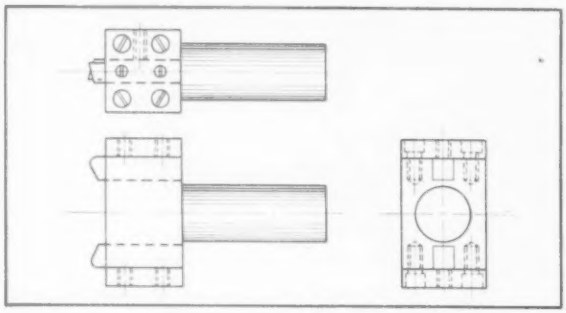
As we use them, we drill one piece slightly undersize and counterbore it for the screw head. The mating part is tapped, the two parts clamped together and reamed through the top part and partly into the mating part to remove some of the threads. We carefully measure the screws so that, on assembly, the body diameter will fit snugly into the holes. We have found this method to be satisfactory for about 90 percent of our fixture work.

Frank M. Butrick, Jr.
Alma, Michigan

Editor's note: While the method proposed by Mr. Butrick is practical for the general run of fixtures, the purpose of conventional doweling is to insure permanent alignment of components, the screws then serving merely as clamping media.

Face Milling Cutter

While the two-toothed face milling cutter illustrated was originally designed to produce a fine finish on flat silver aircraft bearings, it has been used with considerable success on other soft materials such as brass, bronze, magnesium and aluminum, the latter especially.



An inexpensive face milling cutter, such as shown, will produce a fine finish on silver parts, may also be used with other soft metals.

The body, which may have a straight or taper shank as desired, is slotted to receive two carbide-tipped tool bits and capped with plates as shown. The tool bits are clamped with set screws. While the cutting edges of the tool bits are ahead of the center line—entirely satisfactory for silver—they may also be located on the center line, if so desired, by merely offsetting the slots.

Merle Deckard
Detroit Chapter

Drafting Room Hint

Drawings representing many hours of work are frequently ruined when they are smeared with ink when the draftsman, using a ruling pen and a triangle, withdraws the triangle. A simple way to prevent this is to use two triangles, one on top of the other with the top triangle extending slightly beyond the bottom one.

H. G. Frommer
Milwaukee, Wis.

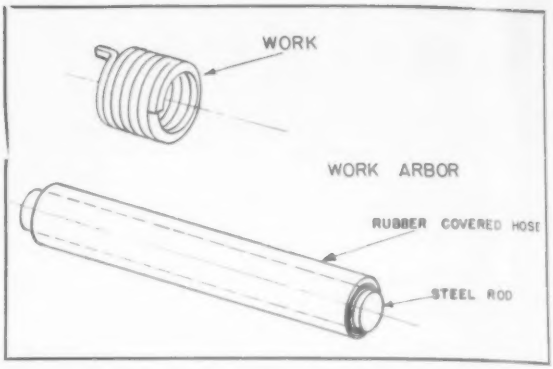
The Tool Engineer pays regular page rates for accepted contributions to these pages, with a minimum of $5.00 for each item.

Centerless Grinder Dodge

A close coiled spring required grinding on the outside diameter, in quantity. Because of the turned out ear, the centerless grinder would not handle the spring in the normal manner, since the ears tangled with the following ends and would not through-feed.

The job was done in the centerless grinder, none the less, by using an arbor made up of a straight rod and a piece of rubber-covered air hose. The air hose fitted snugly over the rod, and the air hose OD was ground until the springs would slide over the rubber with just a little resistance. The function of this arbor is to align each spring with the adjacent ones in spite of the spring ears and ends. The rubber provides a slightly yielding yet firm support which results in uniform OD grinding. The arbors were long enough to hold five springs, and by using ten arbors, one man loading and one man unloading, a continuous stream of arbors and springs passes through the throat of the grinder. A rate of 1200 pieces per hour was maintained on this one-pass operation.

Ed. Cusack
Waltham, Mass.



A rubber hose over a steel rod makes an arbor which will hold the close-coiled springs when fed through a centerless grinder.

Model of Electrical Controls for a Machine Tool

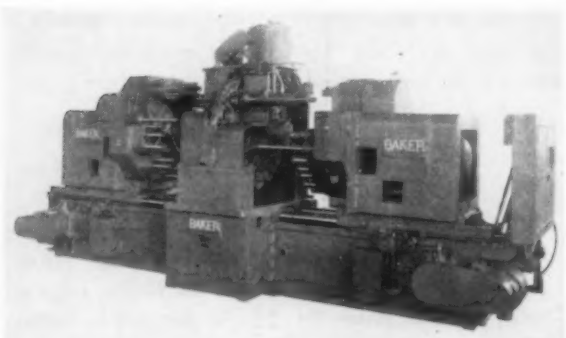
A new method for teaching the design and operation of machine tool controls is being used in the Production Engineering Department at the University of Michigan. An electrical panel which previously had controlled a Baker two-way multiple-spindle trunion-indexing drilling machine (shown in Fig. 1) was obtained from war surplus. This is being used now to control a model machine.

This model machine shown in Fig. 2 is hand-operated but goes through all the normal functions of the original machine. Pilot lights are used on the model to indicate the operation of the motors for the spindles, hydraulic pumps, cutting fluid and indexing the trunion. Electrical solenoids, which normally moved the hydraulic feed valves, now are used to actuate switches and lights showing in which direction the multiple spindle heads should be moved. Signal lamps are installed on each unit in the electrical panel, visually indicating the operation of each switch, relay or time delay relay.

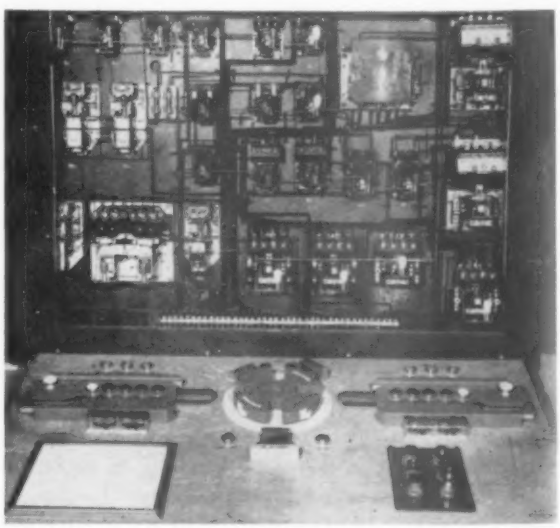
With the aid of the electrical wiring diagram, students are able to study the operation of the motor switches, relays, reversing switches, time delays and electrical interlocking relays. A memory circuit is studied which prevents indexing of the trunion until both heads have been fed to full depth. The Square D Co. cooperated in the development of this model by furnishing the master control and limit switches, while Baker Bros., Inc., made many helpful suggestions in designing the apparatus.

Prof. W. W. Gilbert
University of Michigan

Original Baker two-way multiple-spindle drilling machine. Used by Buick Motor Co. during World War 2.



Mock-up or manually-operated model to demonstrate the operation of the electrical control panel.



Tool Engineering Report No. 6

Elements of Plant Layout

—With An Outline of Procedure

By Andrew E. Rylander

BECAUSE OF THE many factors involved in plant layout—or, as it is sometimes termed, *plant logistics*—the subject can, at best, be only superficially covered in a short article. Consequently, this report must necessarily be confined to simple elements which, in turn, will suggest procedures applicable to various lines of manufacture.

Before going into the "what, why, and how" of plant layout, however, it may be well to briefly outline some of the factors involved. Especially, there should be an outline of the differences between plant design, plant engineering, materials handling and plant layout. For while the four are separate divisions, each important in the scheme of modern manufacture, the terms are often confused because of their overlapping functions.

Functions Defined

Tersely defined, plant design implies the planning of buildings—that is, the architecture—and may or may not be predicated on previous plant layouts. For example, a manufacturer may start operations either in an old building, or in a standardized unit subject to later expansion, all with only casual regard for plant layout, which then follows more or less as an after-

Fig. 1. A building plan showing adjacent yards. Building and crane columns are indicated, together with dimensions of bays. A spur track, along the north wall, also serves the coal bunker. The loading dock serves both trucks and rail cars. Sewer, water, gas, air, power and steam lines are designated as shown at right in the drawing; in actual practice, these should preferably be shown in colors to conform with standard code.

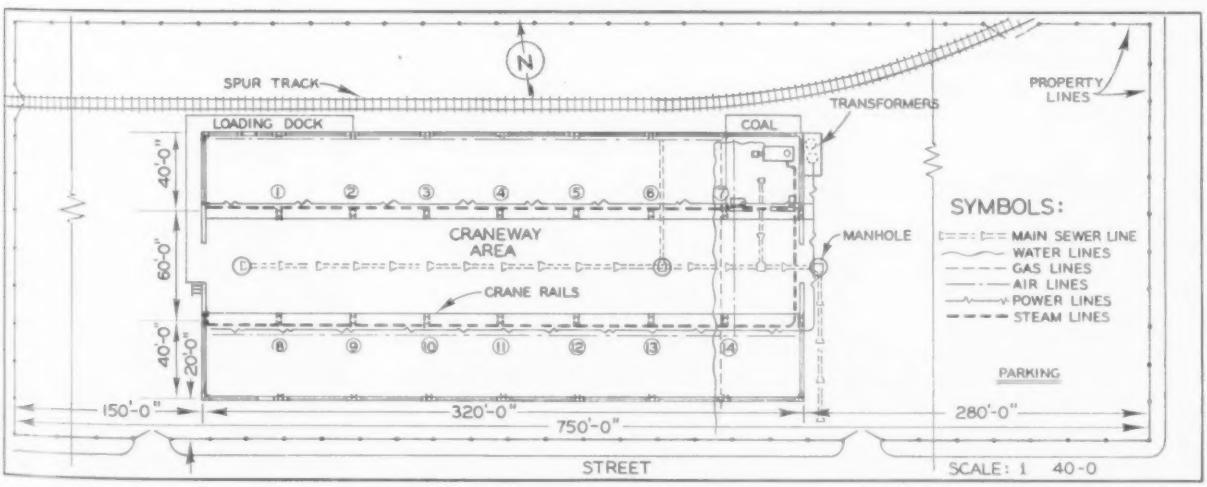
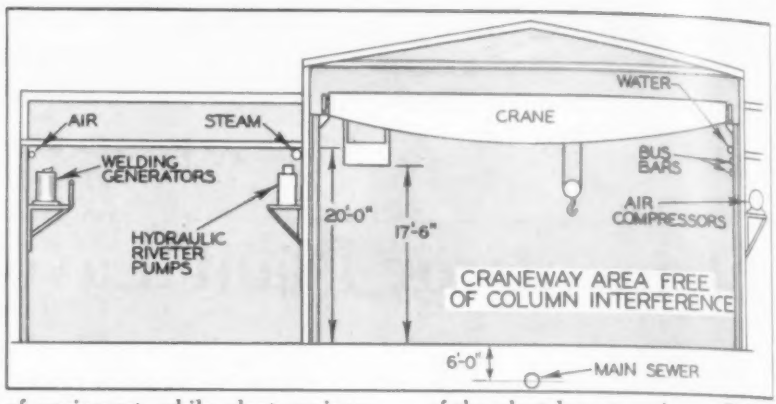


Fig. 2. One of the functions of plant layout is to conserve floor space. This cross-section of a building shows how accessory equipment, such as welding generators, high-pressure pumps for hydraulic riveters, light air compressors and so on are installed on balconies to provide greater effective use of floor space.



thought. Usually, however, building plans are based on known requirements determined by previous plant layout.

Plant engineering, in turn, involves the general supervision of plant property and adjacent yards, installation and maintenance of capital investment equipment and—among other things—the placement of machine tools and other manufacturing equipment from plans submitted by plant layout. It further involves periodic relocation of equipment due to seasonal changeovers, this also from plant layouts.

As the term implies, materials handling is primarily concerned with the handling and transport of materials, not only in a plant, but to and from a plant. However, the route or routes of travel are usually determined by the plant layout engineer, who may also designate the "tools" used for transport—such, for example, as hand- or power-operated trucks, cranes, tramrail or conveyor systems.

Plant Layout a Part of Tool Engineering

Essentially a part of tool engineering, plant layout deals with the disposition of manufacturing equipment for most efficient processing of the product or products being manufactured. Thus, it determines how and where machines are to be located in relation to each other and, in many instances, suggests the type of equipment to be used, all with a view toward easy flow of materials and conservation of valuable floor space.

From the foregoing, it will be seen that while the four divisions are more or less closely integrated, each has a distinct function apart from, yet overlapping, the rest. It should also be apparent that plant layout deals with the *arrangement* of equipment, while plant engineering need only be concerned with its *installation*.

Apart from the three divisions listed above, plant layout is also closely integrated with methods and process engineering—both of which are functions of tool engineering; production planning; inspection and, to a considerable extent, with safety engineering. To further clarify functions, it may be explained that the methods engineer outlines what, in his belief, is the best way to manufacture a part, while the process engineer tabulates sequences of operations and, with due consideration for equipment on hand, designates the tools to be used and the machines on which they are to be disposed.

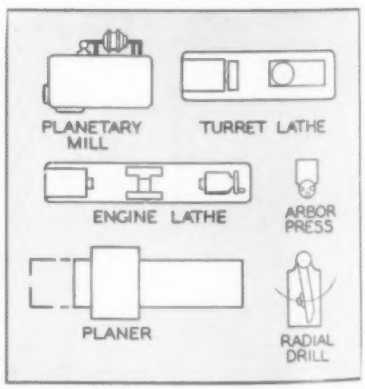
On the basis of these recommendations, tool engineering proceeds to design the necessary tools and to requisition such machines as may be needed to supplement existing equipment. From that point on—or coincidental with a preliminary survey, as the case may be—plant layout takes over and proceeds to plot arrangement of equipment, possibly starting with a flow diagram, of which more later. In view of the many divisions involved, then, it becomes apparent that all must be closely coordinated for most efficient operation of a plant.

The Human Factor

Having sketchily outlined what may be termed the mechanics of plant layout, it may be well to devote a few lines to the human element—that is, to the qualifications of the plant layout engineer. Briefly summed up, he should: (1) be familiar with materials, and methods for their processing and handling; (2) have a broad although not necessarily a specialized knowledge of machine tools and their operation; and (3) be broadly familiar with building construction.

Having these qualifications—to which may be added imagination and a certain inventive ability coupled with the patience to persevere—the plant layout engineer can intelligently propose layouts with due regard for bottlenecks, structural interferences and floor loads. If production-minded—as he should be—he may further effect changeovers with a minimum of confusion and interruption.

Fig. 3. Typical templates such as these are used to spot equipment during trial layouts. They are made to scale from stiff paper or sheet celluloid, or, may often be obtained from manufacturers of equipment.



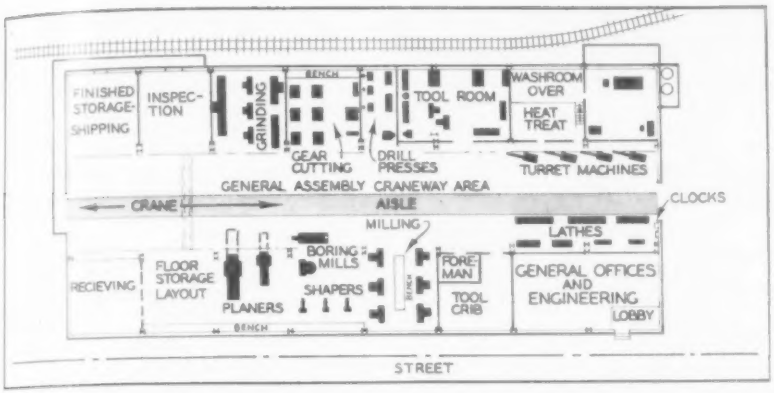


Fig. 4. This is a "trial horse" plant layout, based on the building plan shown in Fig. 1, for a small machine tool plant. Note that the tables of the two large planers run out into the craneway area, to permit crane to lift heavy castings. A large boring mill and the heavy duty lathes are also located in the craneway area, which is also used for assembly.

Variables Preclude Standardization in Plant Layout

With these factors in mind—and all are important to the theme—we now turn to the *modus operandi* of plant layout which, unlike plant design, cannot readily be standardized. For where plant buildings and certain capital investment equipment—as, for example, heavy machines which require special foundations—imply a degree of permanence, plant layout may be seasonably changed due to introduction of new models or new products.

Among other considerations that bar standardization may be mentioned diversity of products and differences in plant buildings, such as whether the latter are single or multi-storied, clear span or segregated into bays. Building design, especially, has a decided bearing not only on plant layout itself but on flow of materials.

A Plot Plan Essential

Naturally, plant layout is considerably simplified if one can start from scratch, as with a new building. In such cases, one can approach the ideal—with, however, scant possibility of actually achieving that goal. But unless originally included in the building plans, one may then dispose such non-productive yet highly necessary departments as offices where they will not interfere with production and/or flow of materials. One may further take advantage of streets, alleys and spur tracks—if any—for spotting of receiving and shipping departments, both with due regard for flow of materials.

Whether starting from scratch with a new building, or with a plant already in operation, one should have a clearly delineated plot plan as a starting point for plant layout. Among other things, this should include the exact location of the building in relation to adjacent streets, alleys, and/or spur tracks, together with orientation, and the exact location of all building columns, the latter preferably numbered so that details may be reconciled with the master plot plan. Widths and lengths of bays, location of exits, and all permanently installed equipment should also be included.

On a separate yet duplicate drawing should be recorded location of main and lateral sewer lines, with manholes; water, gas, air and steam lines, each marked in standard—ASA—color code for the liquids and gases for which they are vehicles. Also included should be location of transformers and power transmission lines.

As a supplementary plan, there should be a cross-sectional drawing of the buildings showing clearance heights under roof trusses and cranes, and the depth of sewers below grade or floor levels. The latter is an important consideration when having to prepare pits or foundations for heavy presses or machine tools.

Such plot and cross-sectional plans are suggested by Figs. 1 and 2, both of which are composites due to space limitations of this article. For example, sewers, pipes and conduits are shown by differently symboled black lines, instead of in color, and may so be interpreted by the reader. Since both drawings are reduced to simple elements, actual proportions may be disregarded. However, the scale may be deduced from widths of the bays and the notation: 1 in. = 40 ft. 0 in.

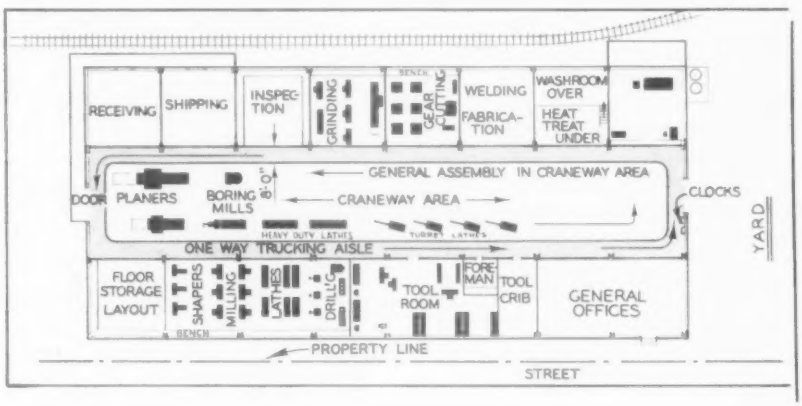


Fig. 5. An alternate to the layout shown in Fig. 4. Here, a trucking aisle runs entirely around the craneway area, thus serving all adjacent bays as well as permitting one-way traffic. Machining of parts in both plans is done in "departments," and work can flow via trucking from one department to another without necessarily crossing the craneway and assembly areas.

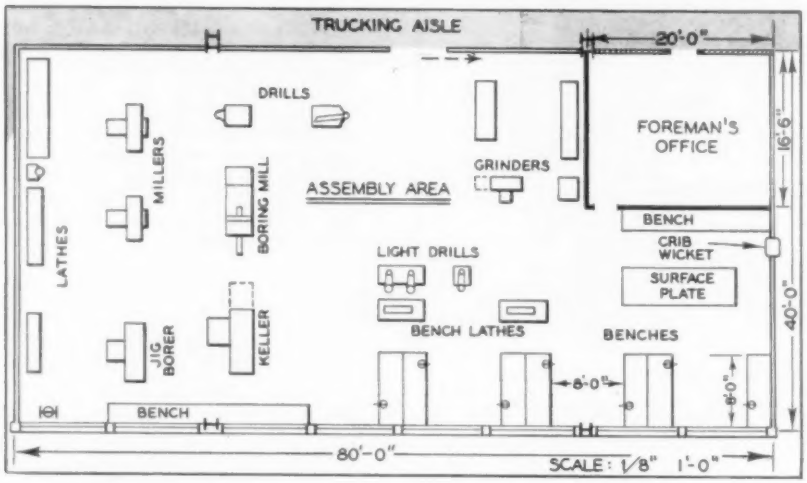


Fig. 6. A detailed layout of the toolroom shown in Fig. 4. Proportions may be judged from column centers, shown in Fig. 1 as 40 ft. Note that columns immediately adjacent are numbered. Work benches are at right angles to the windows, to save eye strain on the part of toolmakers engaged on close bench work.

A Typical Layout

With this particular plot plan as a basis for operation, we will proceed with a simple plant layout, here using scale cut-outs to represent the various items of equipment. These cut-outs, of which typical examples are suggested by Fig. 3, are made to the same scale as the building layout—say ¼ or ⅛ in. to the foot, or smaller. They may be made from stiff paper or sheet celluloid, the latter preferred since it facilitates tracing around the edges. In many instances scale templates may be had, without charge, from manufacturers of the equipment to be used.

Equipped with the basic "tools"—that is, a plot plan and scale models—we proceed to make a plant layout of a small machine tool plant, as suggested by Fig. 4. Here, the boiler room is located in the northeast corner, where the spur track can also serve the coal bunkers. Receiving and shipping are respectively located in the southwest and northwest corners, the latter fronting on the spur track and both served by the loading dock. The general offices front the street in the southeast corner, and a trucking aisle bisects the building, running the entire length of the craneway area.

Coming from receiving, heavy castings move to an adjacent bay for temporary floor storage and possible layout, thence to the planers as a logical choice for the first machining operation. Note that while the planers are located in a bay, the tables run out into the craneway area to facilitate loading of heavy castings. A large boring mill is entirely in the craneway area, as are the engine and turret lathes. Shapers and millers are located in bays on the south side of the building, which also contains the foreman's office and the tool crib.

The boiler remains in the northeast corner, as originally spotted by plant design; next to that, we spot heat-treating, with the men's washroom over. Thus, the three are grouped together where they may be handily served by a lateral sewer.

The tool room is adjacent to heat treating, and in the following order along the north wall are drilling, gear cutting and grinding, with inspection immediately ahead of shipping.

Review Shows "Bugs"

Coldly reviewing this layout, which may be considered a trial horse, we find that while there are a number of commendable points, there are also plenty of "bugs". For example, location of the heavier machine tools shows forethought to crane lift of heavy castings.

On the other hand, the central trucking aisle not only cuts up assembly space but fails to properly serve the bays on the north and south sides. As a result, work in process must necessarily cross the craneway area. Furthermore, receiving is disadvantageously located in relation to the spur track.

So, we table this layout and, while retaining what may be termed the "permanent" fixtures—offices, boiler room and men's washroom—proceed to relocate equipment with a view toward a more efficient layout. This is shown in Fig. 5.

First, we relocate receiving and shipping so that both now front on the spur track. While the latter is

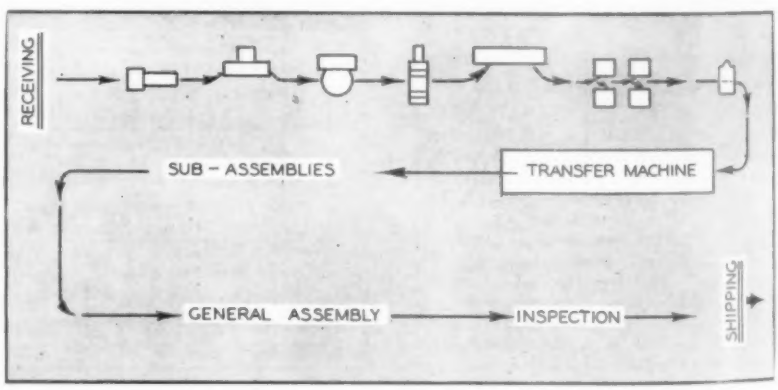


Fig. 7. A schematic diagram showing how straight-line flow may be compromised by zigzagging or doubling back. Machine arrangement is informal, and no particular type of equipment is suggested.

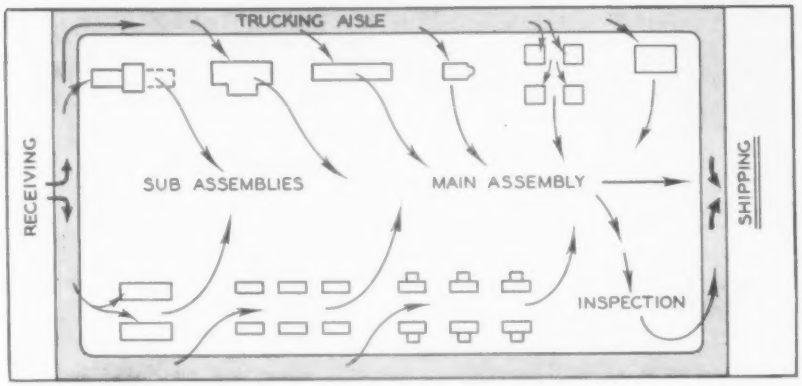


Fig. 8. Flow lines of materials are shown from receiving to various stations, thence to assembly, the whole more or less after the manner of tributary streams flowing into a broad river. As in the case of Fig. 7, machines and arrangement are both informal.

somewhat remote from the trucking dock, we have nevertheless compromised a bad situation. Next, we run an 8-ft trucking aisle around the craneway—assembly area and immediately next to the building columns to provide one-way traffic. So disposed, there is no need to move material across or into the craneway area except as it may be needed for final assembly.

While the heavy-duty equipment is now entirely in the craneway area, there is actually more space for assembly; also, shapers, millers, lathes and drill presses are located for more or less direct one-way flow to other departments—say for second-operation work, heat-treat, inspection and assembly. The toolroom has been moved to the south side of the building, and on the north side, we have added a department for fabricating and welding. In the preceding layout, this would have had to be done in the assembly area; now, boiler room, heat-treat and welding are in adjacent bays so that fumes can be dissipated from one area.

Materials will flow one-way from receiving to and past all departments to final inspection and shipping. As an example, turned blanks will flow from engine lathes and turret machines to gear cutting, necessarily back one bay to heat-treat, thence to grinding and inspection.

It is not implied that either of these layouts typify what may be considered "good" plant layout. For one thing, equipment is shown disproportionately large in relation to building and bay areas, but purposely so to avoid confusing details. These drawings, then, are purely illustrative and intended to show the simpler procedures in plant layout.

In this connection, the reader is referred to Fig. 6, which is an elaboration of the toolroom shown in Fig. 5. Again, the small scale precludes showing all details; however, the layout will show certain features that may be considered as good practice. For instance, the work benches are placed at right angles to the south wall; thus, bench hands engaged on close work do not face the windows and so are relieved from the eye strain resulting from sun glare.

Machine tools are so disposed that there is ample working space around each, with additional room for trucking and clear areas for assembling. The toolroom is further connected with the general foreman's office, while a direct wicket to the toolcrib saves steps and incidental time on the part of the toolmakers. This layout may be considered good from a number of viewpoints.

In the preceding three layouts, we have dealt with what may be termed department layout such as is generally found in machine tool and small tool plants. In such lines of manufacture, it has been found advantageous—and, it may be added, profitable—to group related machine tools in separate departments and, in the larger plants, under separate

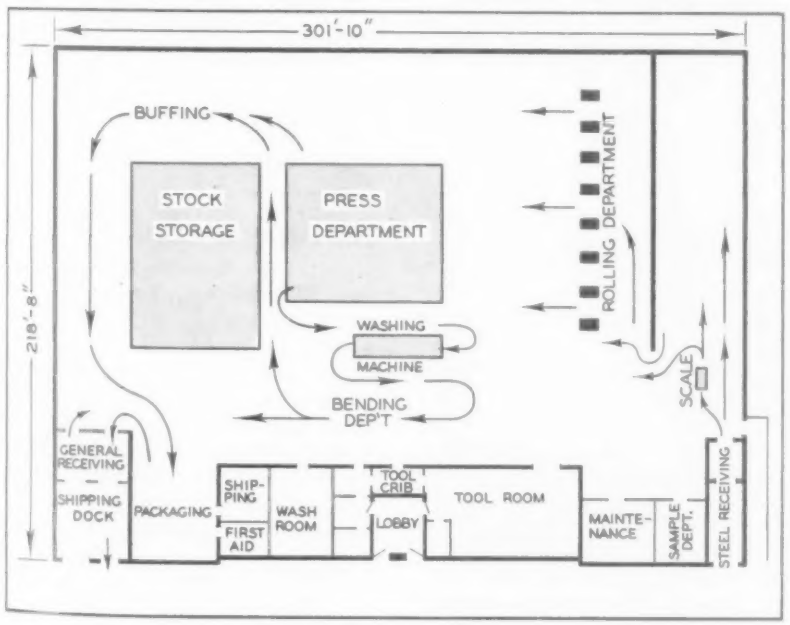


Fig. 9. A flow diagram applied to manufacture of metal moldings. This is an actual "case" diagram of flow lines in a plant noted for manufacturing efficiency.

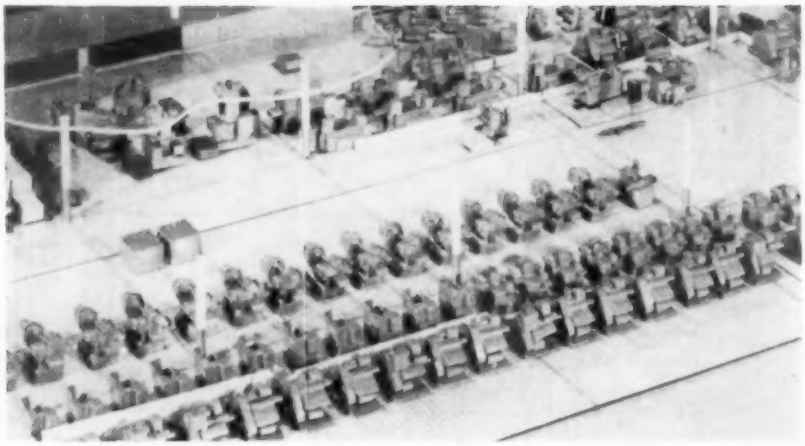


Fig. 10. Plant layouts are more readily "sold" to management and clients by use of scale models such as those shown here and on the cover.

supervision. Thus, there will be planer, miller, lathe, grinding departments, and so on through the list of machine tools employed for the particular type of product being manufactured.

Departments Are "Plants"

In such lines of manufacture, each department may be considered a plant in itself, and layouts may be revised without necessarily affecting other departments. True, it is desirable that departments be so disposed that materials in process will flow from one to another in order of operation sequences and along the shortest possible routes. Such coordination, however, is not always possible, nor, in many instances, even practical.

In this connection, there is a more or less general belief, on the part of the public, that the larger automobile plants are sufficient unto themselves—that is, that all parts entering into a particular make of car are manufactured in the one plant. True enough, that could happen if the management were so minded and finances permitted.

Actually, an automobile manufacturer draws on many feeder plants, some affiliated with the parent company, others entirely independent. And with the trend toward decentralization, divisions may be remotely located, some making engines, some axles, some transmissions, and so on through the gamut of units and parts. Each of these supplier plants, then, is a "department" on a grand scale, and each in turn will have its sub-departments involving plant layout.

Flow of Materials

Conditions permitting, it may be said that the ultimate in manufacturing economy is achieved when materials in process move the shortest possible distance between operations and with the least handling. In this connection, it must be considered that distance has a direct bearing on time which, in turn, has a direct bearing on costs. Measured in terms of wages, depreciation and interest on vehicles, and so on, it would cost proportionately more to truck a load of parts 100 yards than to move it 100 feet. Cost of transportation, then, is directly proportionate to time and distance; the shorter the travel, the less the overall costs.

In moving materials from machine to machine or station to station, the ideal condition would imply a continuous straight-line flow—practically achievable only with transfer-type machines and then only for comparatively short distances. Since, however, physical limitations of plant buildings usually preclude the practical attainment of straight-line flow, one may effect a compromise by doubling back, as suggested by Fig. 7. Or, as suggested by Fig. 8, one may so dispose stations that materials will flow in orderly sequence to sub- and main assemblies.

While both of these illustrations are elementary, to show principles, they are nevertheless in line with accepted practice in the automotive and allied industries. Take, for example, the manufacture of an automobile frame which, starting with steel stampings and progressing to assembly, may involve secondary press operations, welding, riveting, and various sub-assemblies. The equipment involved will be disposed in the order of operations, a press here, a welder there, a drill press next and riveter following, and so on down the line.

The alternate method—as suggested by Fig. 8—is to dispose equipment or departments so that parts produced at each flow laterally to a common artery, more or less after the manner of tributary streams flowing into a river. Here, each department may be provisioned, so to say, by truck or other conveyance, and equipment may be disposed on either side of the main line. As mentioned before, Figs. 7 and 8 are purely illustrative. In Fig. 9, however, is an actual layout of a metal moldings plant noted for efficiency. Flow of materials is indicated by the arrows. This layout indicates not only good plant design but good plant layout with forethought to handling of materials. For example, there are two receiving departments, one for incoming steel and another for general goods, the latter in turn also "doubling in brass" as the shipping department. Finished moldings move to packaging, where they may remain until shipped. There is little if any lost motion from receiving of raw materials through to shipping of the finished product.

One of the purposes of Figs. 7, 8 and 9 was to show the importance of flow lines in plant layout. True, they do not and in most cases cannot indicate where individual machines are to be located, but they do provide for routing of materials in sequence of operations, and so serve a useful and highly important function in preliminary layout. Once the flow has been satisfactorily

determined, equipment can be spotted in to suit the general scheme of layout.

Scale Models Help to "Sell" Plant Layouts

One of the difficulties besetting the plant layout engineer is that, while a layout on which he has labored many be perfectly clear in his own mind, and may further incorporate all of the desirable features, he may not be able to "sell" it to management from a flat drawing. What is needed, then, is something to convey a third dimension to make the layout "stand out." That is best achieved by use of scale models, such as shown in Fig. 10 and on the cover.

Scale models have the further advantage in that they can be easily picked up and shifted, as compared to flat paper cut-outs, and therefore save both time and tempers when making preliminary layouts. For that matter they may be fixed into a permanent, 3-dimensional record once a layout is finally decided on, and there is a marked trend—especially among the larger corporations—to maintain such models both for purposes of exhibition and for convenience in routing operations or as a basis for future revisions. See Fig. 11.

These models are now available from stock from several concerns specializing in their manufacture, or, may be custom-made to suit special requirements; for that matter, "near enough" scale models of special machines can be readily carved from soft wood or molded from modeling clay. However acquired or made, they facilitate plant layout.

Improved Techniques Facilitate Plant Layout

Because plant layout is not only time-consuming but trying on the nerves due to recurrent cut-and-try, various methods have been devised to facilitate layout and, almost without exception, all of these merit serious consideration on the part of the plant layout engineer. For as with all things connected with manufacture, the "tools" used in plant layout are being constantly improved to keep pace with changing conditions.

Among other innovations recently introduced, these include a method employing transparent plastic sheets which, as shown in Fig. 12, are ruled into squares in scale ¼ in. to the foot. The lines are black to facilitate blue-printing.

From a sheet of similar material, except that it is entirely black, may be cut out—or obtained from the supplier—scale templates to represent the equipment to be used in the layout. Strips, cut to proper scale width, represent aisles, partitions, conveyors, office equipment and what have you. These cut-outs, which have an adhesive backing, are then disposed on the master sheet and blue-printed for record. Once prints are made of a trial layout, the cut-outs may be recurrently stripped off and relocated, each tentative plan blue-printed for record, and so on until a satisfactory layout is achieved.

It is not implied that this method is the "last word" as far as time saving is concerned. But, templates stay put once located on the master sheet, as contrasted with paper templates which constantly shift unless tacked down. Furthermore, it saves recurrent redrawing of a layout since it is only necessary to shift templates and make blue-prints.

In the foregoing, we have mentioned that models and master sheets are made in scale ¼ in. to the foot. While this scale may be considered as a standard in commercial layout accessories, it is often preferable to make templates in smaller or larger scale. And here, master sheets and templates scaled 3/16, 3/8, and ¾ in. to the foot have the advantage that they can be readily measured with a common rule. Using ¾ in. to the foot, for example, each 1/16 in. represents 1 inch, while in the 3/8 and 3/16 scales inches are respectively represented by 1/32 and 1/64 in. The larger scale is desirable when making detail layouts of departments.

Working Models

While not generally used, toy construction sets—such as made up from perforated strips or channels—may often serve to sell a layout involving an intricate special machine or conveyor system. For as previously intimated, the plant layout engineer should preferably include inventive ability among his other qualifications. So endowed, he may propose some method of fabrication or materials handling which is not readily salable from a sketch or verbal description.

In such cases, a working model may be made up from a toy erection set which, showing salient principles, could then be analyzed and discussed on its merits. To cite examples, it might be desirable to incorporate a "merry-go-round" in a plant layout, or a conveyor system

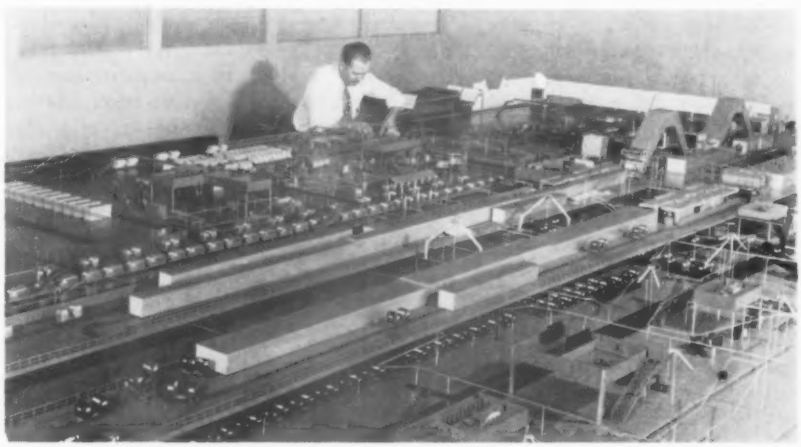


Fig. 11. A three-dimensional layout of a truck assembly plant made with scale models is now a permanent installation, readily available for study and change.

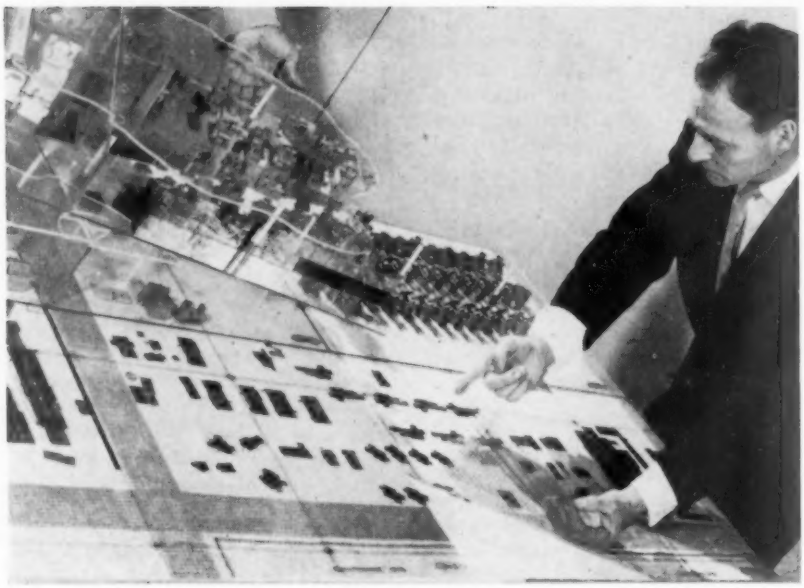


Fig. 12. Blue prints can easily be made from these transparent grid sheets on which the templates have been pasted. Note the dark areas representing aisles. The scale models are optional.

involving recurrent drop and pick-up stations, with return of dollies or carriers to source. The working models would immediately demonstrate their practicability.

Conservation of Space

One of the "musts" in plant layout is conservation of floor space, especially so since every square foot of plant area may be assumed to have a certain rental value. That is, the plant building represents capital investment which must return interest in direct ratio to its useable area. It should not be inferred, however, that conservation of floor space means crowding; on the contrary, it means that equipment should be disposed for maximum operating efficiency.

To be specific, there should be ample room around each machine, or each group of machines, so that workers do not interfere with each other. There should be room for spotting materials in process and, preferably, there should be at least two exits from each station so that, should an accumulation ahead create a bottleneck, it may be bypassed.

Particularly, there should be no interferences along the floor from trailing hose or wires, which cause tripping and therefore constitute an occupational hazard. Wherever possible, such items of equipment as welding generators, high-pressure hydraulic units such as used for hydraulic riveters, light air compressors and such should be disposed on balconies, as shown by Fig. 2. With these units so disposed, electric welding guns and hydraulic—or air—riveters may be suspended over their stations by means of balancers.

Modernization

From the foregoing outline of procedures, it should be apparent that a considerable responsibility rests on the plant layout engineer. He must not only coordinate the work of the various divisions and departments involved in the manufacture of a product, but must further weave the whole into a composite "tool" designed to exact the last fraction of a cent in savings. For in mass manufacture, savings in cents are reflected in the profits of a corporation.

However, the responsibilities of the plant layout engineer are by no means confined to original plant layout alone. More and more, he is playing a stellar role in plant modernization, and as labor and materials costs soar, so must unit costs be pared to effect a balance. Such balance cannot be effected with obsolete equipment, nor, for that matter, entirely with modern equipment unless there is a commensurate modernization in the plant and its layout.

In this connection, it should not be inferred that modernization necessarily implies scrapping equipment which still has useful life. If, for example, a part made of a certain material can only be drilled at so fast a surface speed and feed, and an old drill press satisfactorily performs the drilling, no appreciable saving can be effected by replacing it with a new machine. But, where a machine fails to produce profitably, then certainly replacement is in order.

Modernization, then, implies not only replacement of obsolescent machine tools and other manufacturing equipment, but such revision in plant layout as may be conducive to easiest flow of materials and most efficient processing of goods being manufactured. This goal cannot be achieved by means of machinery alone; for the ultimate in savings, there must be a well considered plant layout as a coordinator of all operations.

Bibliography

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"Introduction to Plant Layout," A. E. Rylander, *The Tool Engineer*

Credits

Chrysler Corp.
Kaiser-Frazer Corp.
Prefabricated Plant Layouts, Inc.

Cover

The cover shows some of the scale models used by The Kaiser-Frazer Corp. on the three-dimensional layout of the huge Willow Run plant.

Another Tool Engineering Report will appear in January issue, *The Tool Engineer*.

Dateline: Indiana 3

EVANSVILLE spelled success October 19 and 20 for the first of Aste's regional meetings developed by the Board of Directors last March. More than 200 members from six states in the south central area gathered at the Hotel Vendome for the conference which marked new progress in ASTE history. Excellent attendance coupled with the serious interest evidenced on all sides drew a blueprint for future regional meetings.

Throughout the busy conference rooms, over dinner tables, in the hotel lobby the talk was the same—enthusiastic approval for the well-rounded program. Much work and much learning was accomplished in the down-to-earth sessions designed to help some of the busiest men in the country carry out their heavy responsibilities in American defense production.

Army Ordnance expert, Brigadier General Merle H. Davis, discussed shortages in ammunition supplies in an address aired by radio station WJPS, an American Broadcasting Co. affiliate. Frank C. Hockema, executive dean at Purdue University, provided stimulating thoughts in his banquet speech on "Tools, Tactics and Techniques".

The board of directors, at their semi-annual meeting, handled a tremendous agenda. Greater understanding of ASTE aims and services grew out of the round table discussion attended by chapter chairmen, board members and headquarters staff. Legal, educational and industrial influences on the professional status of the tool engineer were carefully covered by a six-man panel.

Production in action was studied on tours of the Bucyrus-Erie Co. and Servel, Inc. Developments in carbides were presented at a technical session.

ASTE wives, too, were kept on the go. A sightseeing tour of the Evansville area, a visit to the ceramic studios of Engle in Newburgh and the studio participation broadcast of "Cinderella Week-end" made up their program, topped off with the Friday banquet attended by a capacity crowd of 261 persons.

Ordnance Ammunition Chief:

Tool Engineers Vital in Overcoming Ordnance Problems

By Nancy L. Morgan

Brigadier General Merle H. Davis was introduced at the closing session of the South Central area meeting by Roger F. Waindle, second vice president of the ASTE.

Mountains of Ordnance difficulties arising in a semi-war, semi-peace economy, erupting at times into serious ammunition shortages, were reviewed by Brigadier General Merle H. Davis at the final technical session.

Material shortages, late deliveries on new machine tools, problems in getting new ammunition items into production, and complacency outline the 1951 ammunition picture of what must be overcome if the nation is to meet present-day and future requirements.

"In meeting these challenges," Gen. Davis said, "the United States has a list of assets we did not have in 1940."

Tool engineers have made huge strides during the last six years in improving manufacturing methods which can be applied to nearly every element in ammunition production. They have contributed greatly in saving materials, machines, plant space, manpower, improving safety and giving better products without increased costs.

Second on the list is the invaluable experience gained in the last war. Production records of contractors include quality levels attained by each concern during the war, which help to determine the letting of contracts under current production programs.

The stock of standard high production machine tools preserved from the wreckage of World War II is another 1951 asset. Gen. Davis said, "True, the stock is unbalanced, but what we have has shortened the lead-time to production and lightened the burden on the machine tool industry."

He cautioned, "In spite of being better off, in some respects, than we were in 1940, the road ahead has a lot of bumps." **(Continued on page 70)**

President J. J. Demuth administers the oath of office to new directors H. B. Osborn, Jr. (left), W. M. McClellan, H. E. Collins and G. A. Goodwin.

Progress Reports Highlight Board Session

Four new directors assumed their duties in the ASTE governing body at the regional meeting. Sworn in by President J. J. Demuth were H. E. Collins, G. A. Goodwin, W. B. McClellan and H. B. Osborn, Jr.

Close to 19,000 members were reported on the ASTE roster representing gratifying progress toward attaining the goal of 20,000 in 1952.

A good financial outlook was presented in the report of National Treasurer H. C. McMillen. He cited the substantial profit made by THE TOOL ENGINEER during its first year of Society operation. "Further dedication of our efforts will certainly continue our financial trend and permit increased services to our membership," Mr. McMillen said.

Board members voted to change the site of the 1953 annual meeting from Denver to Detroit and precede the regular convention program with two days devoted to a "Leadership Conference". Chapter chairmen will be brought to Detroit at Society expense to compare notes and learn how other chapters operate.

Harry Conrad, executive secretary, stated in his report that such a conference would fill a void of long standing in providing proper contact between the national organization and its chapters.

The book committee announced that the sales of *The Tool Engineers Handbook* are close to the 28,000 mark. Work on the *Die Design Manual* is well underway. Publishing date has been set for 1953. At that time it will be necessary to start active revision of *The Tool Engineers Handbook* for its second edition, in view of the many changes made in manufacturing techniques since the last war.

New features and services provided by THE TOOL ENGINEER were reviewed by the editorial committee. The revised format, "Tool Engineering Report" and "Tool Engineering in Action" have met with great approval in industry circles, the advertising profession as well by the readers.

The Clearinghouse, set up by the magazine to bring together those companies which have need of subcontractors or suppliers, has been cited by industrial and government officials as an important force in helping to alleviate the machine tool shortage.

Gardner Young, program committee chairman, announced that 200 copies of the book of collected papers and discussions at the 19th Annual meeting have been sold.

The professional engineering committee received a six-month budget from the board to continue its work until March.

The education committee is continuing its program of informing colleges and universities on ASTE scholarship activities. Members are also working to further tool engineering education on the college level.

R. C. W. Peterson, standards chairman, reported that a survey has been made on the initiation of a second standardization project under ASA procedures on the standardization of industrial diamonds. Now nearing comple-

(Continued on page 72)

Better People Key to Better Production

Contributions of the tool engineer to a better way of life, through technical skill, intellectual honesty, enthusiasm and a knowledge of people, were outlined by Dr. Frank C. Hockema, vice president of Purdue University, in his thought-provoking banquet address on "Tools, Tactics and Techniques".

"The high standard of living we now enjoy is based on the tools through which man's ability to produce has been increased a thousandfold," Dr. Hockema said. "If tool engineers are aggressive and imaginative, recognizing the importance of new and better tools as the years go by, they will continue to increase their contribution to the national economy and people's pleasures and comforts."

Being better people is another key to having a more prosperous world. Dr. Hockema said that ingenuity, fair play, and a deeper understanding of human nature will make our great economic empire grow.

He encouraged dealing with people in terms of the known. Human nature rebels against anything it does not understand. The mind works logically so be logical in selling yourself, your product and your services.

"Remember," he cautioned, "that sales are made in the minds of people, not in their purses as so many think. In order to sell effectively, you have to put your heart into your efforts and you have to love your work."

"We cannot get anything for nothing. Look ahead, plan ahead, and use your head. You'll help to create more wealth by producing more," Dr. Hockema said.

Harry E. Conrad, executive secretary welcomes Dr. Frank C. Hockema to the ASTE banquet.

Professional Recognition Growing

Professional stature of the tool engineer was the subject of a panel discussion by six ASTE members. Taking part in the informal session were: Gordon Swardenski, George Tillotson, Halsey F. Owen, Howard C. McMillen, Willis G. Ehrhardt and William L. Dolle. Roger Wallace was the moderator.

"The last ten years has been marked by excellent progress in raising the status of the tool engineer," Mr. Dolle said. "Further growth will be accomplished, as in all professions, by increased skill and greater harmony in human relations. Certainly the place occupied by the tool engineer in the success of American production is realized by the American people. Future recognition depends on us."

Mr. Erhardt summarized legal recognition given the profession. Much remains to be done in this field. Only a handful of states provide registration of tool engineers although engineers in other fields have achieved this recognition. The work of ASTE, its chapters and growth in membership of the Society will aid in attaining the goal.

Services of ASTE all point to increasing the professional status of its members, Mr. McMillen said. Strength in the Society, coordination and enthusiastic interest make up the sound foundation for building that status.

Mr. Tillotson covered the educational scene. "We still have far to go," he said. "Only a minority of colleges and universities give degrees in tool engineering. The first step towards establishing these degrees is getting all available material into academic texts."

Mr. Swardenski brought out in his discussion that tool engineers gain stature through actual practical training as well as through collegiate work. He agreed that present background now provided by colleges for tool engineering is inadequate, but warned against underestimating the on-the-job experience. Basic fundamentals taught by universities only push the graduate up to the door of professional skill. They give him a quicker path to career progress. This is particularly true of tool engineers, a profession which embraces hourly wage earners up to top executives.

Top: National Program Chairman Gardner Young (left) leads a membership discussion with (from the left): Lorin Hayden, E. L. Routzong, William H. Logue, Don Hartter, Duane H. Brighton and E. P. Huchzermeier.

Center: A. B. Clark, national membership chairman (far right) talks with William W. Schug, R. C. W. Peterson, Emil Kitzman, O. J. Onken and Dale Long.

Lower Left: Roger Wallace clarifies a question from the audience at the panel discussion.

Prelude to Leadership Conference

ASTE ran its own town meeting program at the membership conference. Views, ideas, opinions and free discussion were the order of the day. Board members, area chairmen, chapter chairmen and headquarters staff members joined forces to exchange information to make the Society a stronger organization.

Membership reaction indicated a desire for more of the same type of informative sessions. Chapter chairmen found help in chapter operation, programming and knowledge of headquarter services gained at the conference vital in carrying out their responsibilities in the best possible way.

"Success of this meeting," President J. J. Demuth said, "provides ample proof that the Leadership Conference planned for 1953 is a major step in gaining greater understanding of ASTE aims and ideals."

General Davis . . .

(Continued from page 67)

Materials which must be rationed cause shortages in the war production job and almost no one is happy over the quantity assigned him. The United States has ceased to be a treasure house of raw materials. Added to this, civilian economy is more complex and demanding.

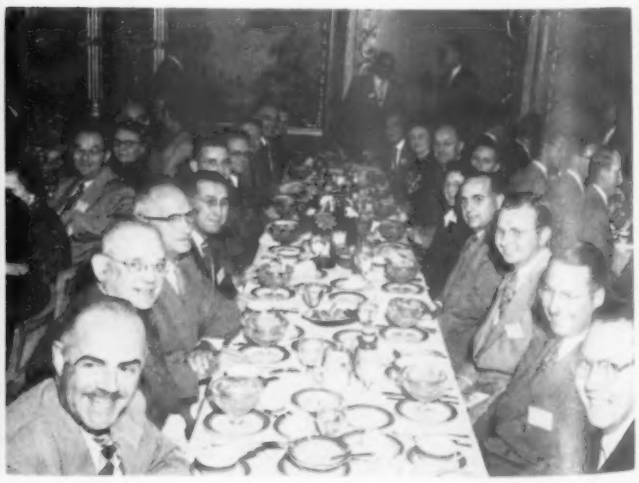
"The CMP allotments of materials for the production of ammunition definitely limit output to the minimum," Gen. Davis said. "When emergencies in some type of ammunition develop, I become a supplicant with a sad story, in the effort to draw out a few more tons of aluminum or some other rationed material."

Serious as material allocations are, Gen. Davis labeled continual postponements in delivery dates of new machine tools from the builders as the worst problem.

Complacency is apparent in the organizations of ammunition contractors, even to the contractors themselves. The all-out effort that goes with a full-scale war is missing. Gen. Davis said, "I hope it doesn't take a serious reverse in the present war or a new attack to hurdle this obstacle."

A challenge presented by the job of producing brand new ammunition items, some just emerging from the development laboratories, was put to the tool engineers. "Cascading these items onto a production line, omitting all orderly product engineering in the interest of speed is what makes tool engineers grow old before their time, but there's intense satisfaction in taking such an assignment and making a good job of it."

Top: Four ASTE wives enjoy Evansville radio broadcast. Other pictures show (from the top): a bus load of members just before departure for plant tours, a few of the 58 members who visited Servel, Inc., members gathered in front of the Hotel Vendome before boarding chartered buses for the Bucyrus-Erie Co. plant, and one of the tables at the Society's banquet.



America Leads the Way in Application of Standards

Detroit, Mich.—"Standardization is not an American invention—there are foreign standards for fields we haven't even touched yet. The real contribution Americans have made is in the *application* of standards," stated the director of the American Standards Association, Admiral George F. Hussey, Jr., (Ret.), when he addressed the Detroit chapter in September.

An example of American standards application was cited by Admiral Hussey in a description of a company which was having great difficulty with excessive breakage and the high cost of extrusion dies.

They found they were buying 60 different brands of tool steel to be used for extrusion dies and about 15 more for back-up pieces and die blocks. Analyses made it possible to classify these 75 tool steels into 12 types.

Further examination enabled them to choose two which had given most satisfactory results with their dies, one for back-up pieces and a fourth for die blocks. Detailed study over a period of a couple of years revealed the one best steel for their requirements.

Conserves Alloy Materials

In boiling 75 tool steels down to the one which best met their needs, the company was able to lower the alloy content. This improved reliability and lowered costs. "Today, that is of inestimable value in the face of shortages of alloy materials and a necessity for conservation to the nth decimal place," Admiral Hussey said.

"The work on extrusion dies pointed such a satisfactory road ahead that they appointed a committee to set up standardization throughout the whole company. This applied standardization developed simplification of operations, better products and lowered costs."

Admiral George F. Hussey, Jr., (Ret.)

Emphasizing the importance of tool engineers in the national industrial scene, Admiral Hussey said, "Standardization is a vital tool for the tool engineer, the man who makes American production possible."

Erie Chapter Visits Ball Bearing Factory

Erie, Pa.—Members of the Society traveled to Jamestown, N. Y. in September for a dinner at Apple Inn and a tour through the Marlin Rockwell Co.

The Jamestown plant is principally concerned with the manufacture of ball bearings of automotive size and larger. Elbert Garrison, production engineer, guided the 87 members and guests through the factory and explained the entire manufacturing sequence, from tubing to testing.

Brian Mead, secretary and treasurer of Marlin Rockwell, welcomed the chapter.

Air-Hardened Steel Makes Designing Easier

Tulsa, Okla.—John Koche, assistant regional manager for the Carpenter Steel Co., Reading, Pa., told the Tulsa chapter that many problems in designing intricate dies and tools can be solved by using low-temperature, air-hardening steel.

More than 40 members and guests met August 9 at the Public Service Co. Building to hear the talk on "Air-Hardening Tool Steels". Mr. Koche cited the need in modern tooling methods for a low-critical-temperature, non-deforming, air-hardening tool steel and explained the steps taken in the development of this type of steel.

ASTE Vice President Reviews Society Services

Grand Rapids, Mich.—Members of the Western Michigan chapter heard Roger F. Waindle, ASTE second vice president, at the September 10 meeting held at the Elks Temple. Mr. Waindle, manager of research and development for the Nugent Sand Co. in Muskegon, gave a short talk on the background of the Society and its services to members and to industry.

Technical speaker was William F. Carr, project engineer at Lear, Inc. He spoke on "Autopilots and Guided Missiles," including a brief history of the autopilot and a resume of recent developments.

Jet Expert Relates Design Experiences

Cedar Rapids, Iowa—A double feature highlighted the program presented September 19 to the Cedar Rapids chapter. The future of jet propulsion was discussed by a designer of the German Messerschmitt 163 Rocket and a metallurgist told how to correct faults in tool steels.

Dr. A. M. Lippisch, aeronautical consultant for the Collins Radio Co. of Cedar Rapids, said the need for wings on aircraft of the future will be eliminated by more reliable and accessible engines. He prophesied speed, safety and maneuverability only dreamed of today.

Tracing the development of jet propulsion, Dr. Lippisch described his work on the first piloted airplane to fly successfully with rocket motors. He also told how he designed the Delta Wing in Germany during the last part of World War II and later brought it to the United States to be tested.

Small blobs of glass played an important role in a demonstration given by George J. Schad, sales metallurgist for Carpenter Steel Co. of Reading, Pa. He showed how tool steel is mistreated by comparing it with the glass blobs, which had been quenched in water as they formed and shattered when an additional load was applied.

Slides pictured ,ways to recognize faults in tool steels caused by decarburization, overheating, underheating, improper tempering, improper quenching, designs not suited to the chosen steel, fatigue and improper grinding.

See Plastics Made

Dayton, Ohio—A better understanding of the manufacture of plastics was gained by 60 ASTE members when they toured the Kurz-Kasch, Inc., plant in Dayton on September 10. Methods of preparing, handling and forming the plastic material were demonstrated for the chapter.

The tour followed a business session and dinner served at Sacksteders' Restaurant.

Grand River Valley Begins Fall Program

Galt, Ont.—Autumn activities of the Grand River Valley chapter opened with a dinner meeting September 7 at Moffat's Hall. The program for the coming year was outlined by Chairman Harry Sehl.

The technical session included slides showing production methods used by the Brown & Sharpe Mfg. Co.

On September 15 more than 150 members and guests of the chapter participated in field day events at an outing held at the Waterloo Game Club.

ASTE Members Advise Production Authority

Washington, D. C.—Responsibility of ASTE in the nation's defense was heightened this fall when the National Production Authority named five members to the advisory committee on the machine tool industry.

Serving on the committee, which also functions as a part of the United States Department of Commerce, are: Swan Bergstrom, vice president of Cincinnati Milling & Grinding Machines, Inc., Cincinnati, Ohio; Ralph J. Kraut, president of Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.; Thomas R. Rudel, president of Rudel Machinery Co., New York City; Frederick S. Blackall, president of Taft-Pierce Mfg. Co., Woonsocket, R. I.; and James Y. Scott, president of Van Norman Co., Springfield, Mass.

Col. Bennet Speaks at Mohawk Valley Meeting

Utica, N. Y.—The importance of radar in the defense of the United States was emphasized in a speech on electronics delivered at the September meeting of the Mohawk Valley chapter. Program speaker was Col. J. A. Bennet, deputy director of the electronic development division at Griffiss Air Force Base in Rome, N. Y.

Col. Bennet brought out the uses of electronics in industry, as a science tool and as a military tool. In a brief historical outline, he covered the work of Thomas A. Edison and Dr. Lee DeForest, pioneers whose studies made possible present-day remote control of aircraft.

More than 50 members and guests attended the technical session held at the Moose Home.

Long Beach Members Tour National Supply Co.

Long Beach, Calif.—A tour through the Torrance plant of the National Supply Co. on September 12 gave Long Beach members first-hand knowledge of the operations of one of the largest oil tool and heavy-duty draw works manufacturing concerns in the West.

The company makes alloy steels for aircraft parts, bearings, oil tools and turns out products ranging from precision roller bearings to the largest types of machine work.

David Sowle, supervisor of industrial relations and host for the tour, guided 80 ASTE visitors through the principal buildings. Special guests attending were Ben Hazewinkle, National Director, and Dick Lynch, Chairman of the National By-Laws Committee.

Study of Drawing Problem Urged by John Lengbridge

Rochester, N.Y.—Featured speaker at the Society's September meeting was John W. Lengbridge, charter member of the Toronto chapter, author of 15 articles recently published in THE TOOL ENGINEER, and veteran of 40 years experience in the metalworking field. He spoke on "Metal Flow in Deep Operations on Aluminum."

Mr. Lengbridge, in white shirt, points out detail on aluminum presswork.

Mr. Lengbridge discussed in detail the number of draws required to shape different articles to a finished stage, citing the importance of the tool engineer making a thorough study of the drawing problem.

"Unless this is done," he said, "the tool engineer will find himself in the embarrassing position of not having provided enough drawing operations to do the job properly, and not having appropriated money for building the extra dies."

The talk was graphically illustrated with slides and a variety of sample parts, including examples of impact extrusions of 3S aluminum. Many of the sample parts had been scribed with flow lines which clearly showed the procedure in properly developing a blank.

Hunting Movies Viewed

Elmira, N.Y.—"Sportsman Night" was the theme for Elmira's first autumn meeting held September 10. Films on hunting and fishing adventures were shown at the Mark Twain Hotel to 50 members and guests. The evening's program also included a business session, buffet supper, and card games.

Committees Report . . .

(Continued from page 68)

tion is the work of the standards committee on identification and classification of tool steels.

Early promotional activities for the 1952 Exposition have resulted in selling two-thirds of the available floor space. Exhibitors are asking for larger areas for their displays. A "Feature Day" plan is included in the well-balanced schedule of technical sessions tours and meetings. Each day will be set aside to highlight some one broad class of exhibits.

Membership chairman A. B. Clark reported that 100 membership kits have been sent to chapters to help in their membership programs. Voice recordings made by President Demuth and other Society representatives on membership, programs, and THE TOOL ENGINEER will be mailed to chapters during November. The last one to be distributed will carry the message of the 1952 Convention and go out in March.

Area captains named by the committee to coordinate chapter membership programs include: T. C. Bradford, New England states; A. B. Clark, Cleveland-Akron-Erie-Pittsburgh; B. J. Hazewinkel, Pacific coast states; E. Huchzermeier, St. Louis-Midwest area; Emil Kitzman, Philadelphia area; R. W. Miller, Cincinnati and Southern states; O. J. Onken, Chicago-North Central states; G. A. Rogers and H. H. Whitehall, Canadian chapters except Windsor; W. W. Schug, Northern New York; C. M. Smillie, Michigan-Toledo area; and W. L. Foss, Denver area.

Chapter chartered since last March, as listed in the report of the membership committee are: Lancaster, Pa.; Tulsa, Okla.; London-St. Thomas District; Los Alamos, N. M. and Albuquerque, N. M.

Correct Tap Designs Stressed by Speaker

Toledo, Ohio—Tapping problems were outlined for Toledo members at their September 26 technical session by Harry Conn, chief engineer of Scully-Jones & Co.

"Considerable care should be taken in making taps," he said. "Some manufacturers use the same style tap for every operation, but there is a right tap design for each material. It is up to the individual who does the specifying or ordering to get the correct tap."

Mr. Conn stressed the importance of the size of the hole. A 100-percent thread is only five percent stronger than a 75-percent thread. A 50-percent thread that is deeper than one and one-half times its diameter is 80 percent as strong as a full thread.

T.E. News Editor Joins Automotive Publications

After nearly ten years of service with the Society, Doris B. Pratt, ASTE News Editor of THE TOOL ENGINEER, has accepted a position as assistant editor of *Ward's Automotive Yearbook* and staff writer on *Ward's Automotive Reports* of Detroit.

Best known to the members as "Doris", Miss Pratt holds the record for term of service at ASTE headquarters. With a background of New England retail management and Detroit advertising agency experience, she joined the staff at the close of 1941. After a few months in a stenographic opening, she became secretary to the executive secretary.

In this and other capacities she produced the first portfolio of technical speakers and films distributed to chapters, edited and processed reports and minutes, designed office forms, bought printing, directed the indexing and publication of the first edition of the new constitution and by-laws, and helped make physical and program arrangements for national meetings.

She organized and operated a chapters' service bureau, handling a wide range of special requests from chapters and members, headed the program and public relations departments.

In 1944 when the national officers authorized the publication of a member newspaper, Doris initiated ASTE News. Working on her regular assignment during office hours and writing the news evenings, she brought out the first issue of what has become one of the most heavily read sections of THE TOOL ENGINNER. This feature was incorporated in the magazine when the Society took over its publication in 1945.

As News Editor, Doris has covered ASTE's national activities, chapter events and news of individual members. She has reported conventions and expositions, directing the photography and sometimes pinchhitting for the cameraman. In addition she has made surveys of Society projects for publication in the magazine, has compiled helps for chapter editorial chairmen, and has arranged special events such as the Bermuda cruise that followed the New York convention last spring.

In her new position she may be interviewing ASTE members in the automotive industry.

Hear Evinrude Engineer

Milwaukee, Wis.—ASTE members of the Milwaukee chapter heard Harris E. Ewald, chief engineer of the Evinrude Outboard Motor Division of Outboard Marine & Mfg. Co., speak on the development of outboard motors at their meeting held September 13.

More than 180 St. Louis members and guests turned out to hear National President J. J. DeMuth (right) speak at their "Suppliers' Night" meeting in September. At the left, Erwin Huchzermeier, first vice chairman, presents copies of *The Tool Engineer* and other information included in the ASTE membership kit to Dolph Boettler, chairman of the membership committee of St. Louis chapter.

Films Teach Operations

Springfield, Ohio—Movies on various phases of industrial operations, sponsored by the Springfield chapter, are being shown in a twelve-week course offered in cooperation with the Springfield public schools. Classes began September 25, meet two evenings a week.

Subjects to be covered include aluminum, grinding, arc welding, carbide tools, industrial hydraulics, magnesium, lathe work, gas welding and cutting, gearing, and safety.

Positions Available

DESIGN ENGINEERS—The Taylor-Winfield Corp., 1052 Mahoning Avenue, N.W., Warren, Ohio, a leading electric resistance welder and electronic control manufacturer, has five openings for design engineers in their mechanical engineering department. These are permanent positions, provided men selected prove they have the necessary skill and ability. Men with resistance welding design experience are preferred. However, recent mechanical engineering graduates will be given careful consideration.

The work is 100 percent board work, involving the design of electric resistance welding machines and component parts, such as jigs and fixtures used in conjunction with this type of equipment.

Experience or training in electromechanical machinery would be a definite asset in meeting job requirements. the personnel department. State age, education, experience, salary expected and other pertinent data.

Explains Manufacture of Surveying Instruments

Baltimore, Md.—Methods employed in the manufacture of modern surveying instruments were explained by H. P. Tanner of the Henry Wild Surveying Instrument Supply Company of America, Inc., at the September meeting of the Baltimore chapter.

He outlined the sequence of manufacture and technique used in production, emphasizing the extremely close working tolerances necessary for making the precise instruments. A movie showed the actual processes of cutting, grinding and finishing the prisms, lens and other component parts.

William Krell, superintendent of the Williamson Free School of Mechanical Trades in Media, Pa., was the coffee speaker. He gave a resume of the various trades taught at the school and told how the students participated in the maintenance and operation of the school facilities.

Sponsors Night Classes

San Francisco, Calif.—A comprehensive course in "Fundamentals of Tool Engineering" is being sponsored this fall by the Golden Gate chapter.

The evening classes, directed by Henry De Coursey, are meeting twice a week through December 19. Included in the activities are technical movies and slides, tours of local plants, and lectures by guest speakers who are leaders in various fields of tool engineering.

Speakers Don Ping (center), athletic director of Evansville College, and Thomas D. Detherow (far right), district sales manager for Bryant Chucking Grinder Co., join Evansville members Henry Pernicka (far left), Dean Lowe, and Henry Appel at the social hour following the September program.

Latest Techniques at Sperry Described

Newark, N. J.—New gear manufacturing and inspection methods employed by the Sperry Gyroscope Co., were outlined at the September meeting of the Northern New Jersey chapter. Representing the Great Neck, N. Y., firm was Charles Aldino, who spoke before an audience of 150 ASTE members at the Robert Treat Hotel.

"The latest fire control and flight instrument data requirements demand fine pitch spur and helical gears with precision accuracy," Mr. Aldino said. "This development brought about our improved techniques." His description of Sperry's present standards, machines, work-holding tools, cutters, inspections, master gears and master racks was illustrated by slides.

Racine Offers Scholarship

Racine, Wis.—High school seniors will compete this year for the first mechanical engineering scholarship given by the Racine chapter.

Selection of an outstanding man for the $200 award will be based on academic standing and financial need, announced Charles E. Moran, education chairman. Aptitude for engineering and grades in mathematics, shop and science will also be emphasized.

Applicants for the scholarship will be limited to those intending to enroll in an accredited college or university.

Steel Production Pictured

Indianapolis, Ind.—A film in color on the production of die steels and their applications was shown at the dinner meeting of the Indianapolis chapter held September 6 at the Athenaeum. The movie supplemented a talk by L. E. Gippert, metallurgical service engineer of the Allegheny Ludlum Steel Corp. of Brackenridge, Pa.

Tells How to Avoid Frauds

Kansas City, Mo.—Ladies Night on September 5 initiated the fall season of meetings for the Kansas City chapter. A representative of the Better Business Bureau, L. E. Christy, gave the inside story on "Rackets That Get Your Money" to a crowd of eighty members, their wives and guests.

He outlined the schemes used to get money illegally, explained the purpose of the bureau and told how it investigates complaints.

Other Society News In This Issue

Chapter listings include member as well as meeting news.

Talks on Internal Grinding

Evansville, Ind.—New developments in internal grinding were reviewed for the Evansville chapter at the September meeting. The high-frequency wheel head which can turn up to 50,000 rpm was cited as the most important advance in recent years by Thomas D. Detherow, district sales manager for Bryant Chucking Grinder Co. of Springfield, Vermont. Other developments include pre-loaded ball bearing slides and the double spindle grinder.

A movie showed the use of cams for contour grinding and various methods of chucking work for internal grinding.

The coffee speaker was Don Ping, athletic director of Evansville College, who told football anecdotes from his coaching experience.

Attendance Hits Peak

Detroit, Mich.—A record-breaking attendance of 350 members and guests enjoyed a variety of activities at Detroit's annual outing on August 11.

Golf, softball, bait casting, and horseshoe pitching were listed on the agenda at Glen Oaks Golf Club. Roger Bianco won the chapter golf championship. An old-fashioned barbecue dinner climaxed the day.

Members serving on the program committee included Al Conti, Douglas Anderson, Jack Wagus, Leonard Joseph and Bill Ackerman.

'Average Person' Theory Disputed by Author

Saginaw, Mich.—"Keep your individuality," advised George A. Bowie, author and lecturer with the Firestone Tire and Rubber Co. of Akron, Ohio, in a talk before the Saginaw Valley chapter.

Mr. Bowie said, "Much of our individuality is lost when we consider ourselves as average persons." He pointed out that since people differ greatly from one another, no one is really average. Realization of this fact is basic in getting along with each other as well as with ourselves.

The dinner meeting, held September 20 at Zender's Hotel in Frankenmuth, was attended by 70 members and guests.

S. P. Hall Gets New Post

Detroit, Mich.—Stuart P. Hall of the Detroit chapter is now vice president of Denham and Company, Detroit advertising, merchandising and public relations firm.

Mr. Hall was formerly general manager of Rogers Publishing Co. and editor of *Design News*. He also edited publications of the Buick Motor Division of General Motors.

Develop Solutions to Contour Problems

Cincinnati, Ohio—More than 100 members and guests of the Cincinnati chapter met September 11 for dinner and a business session at the Engineering Society headquarters.

James R. Keen, sales manager for the King Machine Tool Division of American Steel Foundries, explained the solutions developed to permit production contouring of jet engine parts with closely held tolerances in his talk on "Contouring Jet Engine Parts on Vertical Boring and Turning Machines."

Toledo Members Visit Auto Lite

Toledo, Ohio—Various phases in the manufacture of generators were studied by the Toledo chapter when they toured the Electric Auto Lite Co. plant in September.

Members saw armature laminations blanked out three at a time. The method of catching the blank, while not elaborate, was effective. A rod with a diameter slightly less than the hole in the blank was placed immediately below the punch. The blanks fell on this rod, for easy handling of the laminations.

A later stage consisted of assembling a fixed number of laminations to make a single generator. The number to be used was determined by weighing. Proper alignment depended on a magnetic device.

The case for the generator was made of stock about one-half inch thick. Slots were blanked out. The piece went through two operations to form a cylinder which was welded along the seam.

Coming MEETINGS

BINGHAMPTON—November 7, 7:00 p.m., Vestal American Legion. Speaker: M. F. Judkins, chief engineer, Firth Sterling Steel & Carbide Co., Pittsburgh, Pa. Subject: "Use of Carbide in Industry".

CEDAR RAPIDS—November 16, 6:30 p.m., Hotel Montrose. Annual Ladies Night, dinner and dancing.

CHICAGO—November 13, 7:30 p.m., University of Illinois, Navy Pier. Speaker: A. M. Lane, regional manager, Vickers, Inc., Detroit. Subject: "Hydraulic Controls". March 17-21, 1952. Tool Engineers Industrial Exposition and 20th Annual Society Meeting.

CLEVELAND—November 9. Speaker: Harry Conn, chief engineer, Scully-Jones & Co., Chicago. Subject: "Production Tooling Problems".

DETROIT—November 8. Plant tour. Student Section: November 15. Subject: "Motion and Time Study".

LANCASTER, GREATER—November 20. Speaker: G. E. Brumbach, metallurgist, Carpenter Steel Co., Reading, Pa. Subject: "Application of Tool Steels". December 11. Plant tour, Armstrong Cork Co.

LOS ANGELES—November 17, 8:00 p.m. Hollywood Roosevelt Hotel. Joint meeting of West Coast chapters and ladies night, with national officers present. Speaker: Dr. Howard F. Seifert, Jet Propulsion Laboratory, California Institute of Technology. Subject: "Rockets and Guided Missiles".

MILWAUKEE—November 9, 6:30 p.m., Milwaukee Elks Club. Speaker: Herman Goldberg, president of Snow Mfg. Co., Bellwood, Ill. Subject: "Drilling, Tapping and Threading Equipment".

MUNCIE—November 7. Speaker: W. A. Papworth, staff engineer with Potter Cable Machine Co., Syracuse, N. Y. Subject: "Abrasive Belt Grinding". December 8. Annual Christmas party.

(NEWARK) NORTHERN NEW JERSEY—November 13, 8:00 p.m., Robert Treat Hotel. Speaker: E. E. Cathout, regional product engineer, Behr-Manning Co., Div. of Norton Co., Troy, N. Y. Subject: "Coated Abrasives".

NEW HAVEN—November 8. Speaker: A. H. d'Arcambal, vice-president, Pratt & Whitney Div., Niles Bement-Pond Co., West Hartford, Conn.

ROCHESTER—December 3. Speaker: J. S. Gillespie, Carboloy Co., Detroit. Subject: "What the Tool Engineer Should Know About Cemented Carbides".

SCHENECTADY—November 8. Speaker: Arthur R. Tobin, Fellows Gear Shaper Co., New York City. Subject: "Highlights of the Art of Generating and Gear Manufacturing Equipment".

TOLEDO—November 14. Speaker: W. Maxwell Wheildon, research and development engineer, Norton Co., Worcester, Mass. Subject: "Norton's Experiments With Non-Metallic Wear Resistant Materials".

TORONTO—November 7. Speaker: P. Leckie Ewing, Buttersfield Div., Union Twist Drill Co., Rock Island, Quebec. Subject: "What's New in Cutting Tools". December 5. Speaker: Archie Smith, Union Screen Plate Co. of Canada, Ltd. Subject: "Electro Polishing and Plating".

(WASHINGTON, D. C.) POTOMAC—November 1, 6:45 p.m. Speaker: G. T. Willey, vice-president and assistant general manager, Glenn L. Martin Co., Baltimore. Subject: "Leadership in Industry". December 6, 6:45 p.m. Speaker: W. P. Coomey, general superintendent, Rice Barton Corp., Worcester, Mass. Subject: "Carbide Tools".

WINDSOR—November 12, 6:15 p.m. Prince Edward Hotel. Talk and films on Sundstrand lathe and milling operations, sponsored by Alison Machinery Co., Ltd. Speaker to be announced. December 10. Program sponsored by D. M. Duncan Machinery Co.

Past Chairmen Honored by Peoria ASTE Members

All but two of Peoria's past chairmen were at the September meeting to receive the thanks and appreciation from more than 130 members and guests for "jobs well done." Pictured in the front row, from left to right, are: C. B. Hartsock, James O. Knight, Earl Kane and J. H. Benedict. Standing are: Eugene M. Bertschi, Harold E. Schmidt, Robert W. Bayless, featured speaker and Third Vice President Thomas J. Donovan, Jr., Present Chairman Duane Brighton, Robert C. Kolb, Gordon Swardenski and V. W. Joslin. Joseph Berry and Carl Holmer were not able to attend.

News in Metalworking . . .

OVERSEAS FIRM ORGANIZED

Formation of a company known as Norton Behr-Manning Overseas, Inc., has been announced by Norton Co. of Worcester, Mass., and Behr-Manning Corp., of Troy, N. Y. The new company is scheduled to handle the export business and direct the subsidiary plant operations of these two corporations throughout the world. Headquarters will be in Worcester.

Directors of the organization, who also are directors of the Norton and Behr-Manning, include Milton P. Higgins, Ralph F. Gow, Herbert A. Stanton, Elmer C. Schacht, A. Donald Kelso and Henry M. Elliot.

Mr. Stanton also was named President of the firm, while Mr. Kelso became its executive vice-president.

EUTECTIC ANNOUNCES WELDING COMPETITION

A total of $2000 in cash awards, topped by a $500 first prize, will be presented to winners of this year's contest announced by Eutectic Welding Alloys Corp. Closing date for the competition, which began October 1, is June, 1952.

Participants in the contest, which is open to engineers, metallurgists, researchers, instructors, welders and students, among others, may submit welding papers on one or more of the following subjects: oxy-acetylene, low melting filler; oxy-fuel gas, low melting filler; brazing and bronze welding; silver alloy filler metals; soldering filler metals; hard facing and resurfacing with a low melting filler; lower melting filler metals for metallic arc, inert arc and carbon arc applications. Competition is divided into two categories—for papers on "Welding Engineering and Theory" and those on "Practical Welding Applications." Both divisions, according to the company's announcement, must cover technological and research aspects, procedures and applications of the use of lower melting filler metals in the non-fusion welding processes.

CARPENTER BUYS WIRE WORKS

The Webb Wire Works, established for 50 years in New Brunswick, N. J., has been purchased by The Carpenter Steel Co., according to recent announcement.

Although Ernest H. Webb, president, is retiring, he will continue for the present as management consultant. Everett F. Waltman has been appointed manager of the company, while other personnel remains unchanged.

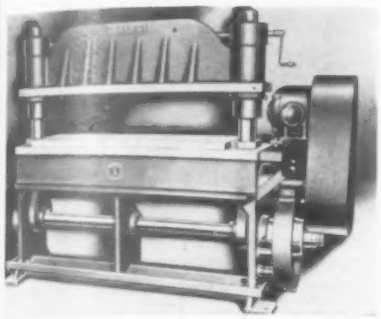
MONARCH PLANS EXPANSION

Directors of The Monarch Machine Tool Co. recently approved a further expansion of the company's plant and equipment. This will be Monarch's second addition within a year.

HYDROPRESS TO BUILD PHILIPPINE STEEL MILL

The Loewy Rolling Mill Div. of Hydropress, Inc., has been awarded a contract for a steel mill from the National Shipyards and Steel Corp., Engineer Island, Manila, Philippines, an agency of the Philippine government. The award is said to cover the supply of a complete merchant and structural mill installation including all mechanical and electrical equipment, valued at approximately 2,000,000 dollars.

Tools of Today . . . .



Punch Press

Wales Twin Column punch presses have just been announced by the Wales-Strippit Corp., North Tonawanda, N. Y.

These presses may be used for all types of blanking, forming, drawing and bending. A self-contained shearing attachment is available as optional equipment for precision shearing. Due to the similarity of design between Wales Twin Column punch presses and a standard die set, these presses, in many cases, eliminate the necessity of die sets.

The ram guides are 4 in. in diameter, precision ground, highly polished, and positioned vertically at exactly 90 deg. The actuating mechanism of the ram operates inside the vertical ram posts.

Guide sleeves move up and down on the ram guides. These sleeves are hand scraped, individually fitted, and held to the close tolerance of 0.00025 in. Long press life and perfect alignment is assured by heavy-duty liners in the sleeves which are fully enclosed by a two-way seal that eliminates dirt and chips by wiping the ram posts clean. The other side of the two-way seal retains a half-pint of oil for positive lubrication.

Herringbone bull gear and pinion gears in Wales Twin Column punch press provide quiet, smooth operation due to precision tooth spacing and maximum number of teeth continuously in mesh.

Exclusive dual purpose clutch counterbalance is a feature that supplements the conventional friction-type brake which is installed on the end of the shaft.

Knock-out attachment, punch shank adapter, pneumatic draw die cushions, friction-clutch arrangement, variable speed arrangement and self-contained shearing die attachment are available as optional equipment.

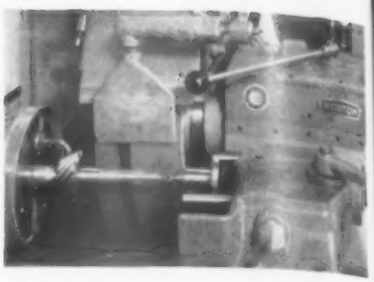
For complete information on the four models of Wales Twin Column presses, write to the manufacturer for Catalog TC.

T-11-771

Cutting Compound

A new cutting compound has been developed by Motch & Merryweather, 715 Penton Bldg., Cleveland 13, Ohio. Triple-Chip heavy duty anti-weld soluble oil is especially valuable for heavy-duty work uses. As established by extensive laboratory testing, Triple-Chip withstands terrific heat for long periods, adheres to the tool and carries through to the cutting edge, mixes readily with water, and resists contamination. Triple-Chip soluble oil does much to keep chips from welding to the tool because of its tenacity in sticking to the tool and its maintenance of the high heat transfer of water. It resists rust, and has been found non-injurious to the skin, odorless, smokeless and non-corrosive; helps prevent flying material, and maintains its properties in storage.

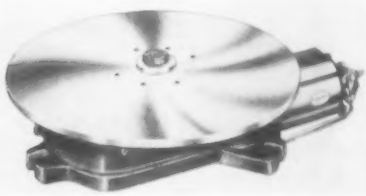
T-11-772



Wheel Truing Device

This automatic grinding wheel truing device made by The Norton Co., Worcester 6, Mass., automatically performs angular, step, straight or combination formed-wheel face-truing at the touch of a push button. The diamond truing tool which is located inside the wheel guard above the wheel, makes a round trip at a predetermined feed and speed across the wheel face when the device is actuated through a push-button control. The rate of speed of diamond travel when not in contact with the wheel is automatically increased to reduce the overall truing time.

An advantage of the Wheel Guard truing device is that it permits a close control of the amount of abrasive removed from the wheel, thus reducing wheel cost per piece ground. Another advantage is that it trues the wheel without disturbance of table settings, and without a special positioning of the wheel head. T-11-781



Heavy Duty Dial Feed

An electrically-controlled, air-powered rotary work feeder with a 22-in. diameter table top has been announced by The Bellows Co., 230 W. Market St., Akron 9, Ohio.

The new dial feed table (Model BRET-22) can be set to position 4, 6, 9, 12, 18 or 36 stations. The 22-in. diameter table will position quickly and accurately loads up to 1000 lb. Cushioned air power eases the table into position where it is locked by an air cylinder.

The table is powered by a special 3-5/8-in.-bore Bellows air motor, complete with built-in Electroaire directional valve and speed controls. The valve is controlled by 12-volt solenoid control units which are guaranteed against burnout. Table top is easily removed for mounting jigs and fixtures or oversize tables.

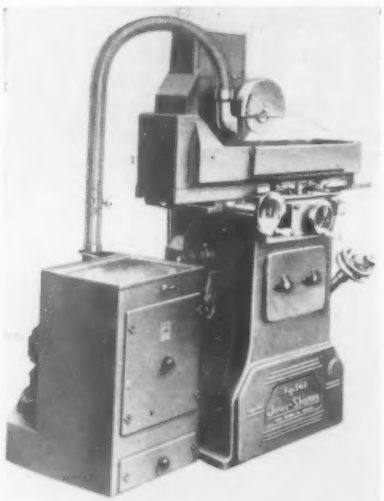
Full details may be obtained by writing the company. T-11-782

Surface Grinder

British Industries Corp., the representative in the United States for Jones & Shipman of Leicester, England, is now offering for early delivery the type #540 Hydraulic Surface Grinder.

This precision surface grinder has completely centralized controls.

The vertical adjustment of the wheelhead is in 0.0001-in. divisions and the fine adjustment for the vertical wheelfeed is 0.0001 in. All controls are so located that they are within easy reach of the operator. The wheelhead spindle runs in plain journal and thrust bearings, and is hardened, ground and tapered at the front end to receive grinding wheel flange plates. The bearings are diamond-bored and the spindles are ground and super-finished to within two micro-inches, rms. The drive to the spindle is from a one-hp constant-speed motor, fitted on vibration-proof rubber mounting and mounted inside the column on the wheelhead slide.



The wheelhead slide operates on preloaded ball-bearing rollers running on precision-ground bar guides. This feature insures the necessary rigidity of wheelhead location in all positions of its vertical traverse and this provides extremely sensitive control of the wheel feed, essential for precision and quality of grinding.

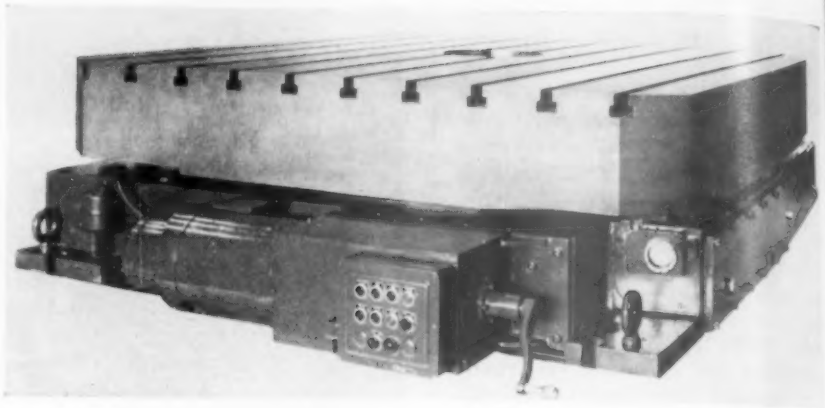
The table traverse is arranged for hydraulic and hand operation, and either can be used. The hydraulic system operates at a maximum pressure of 120 lb. Because of this the flexible tubes are lightly loaded and not liable to break.

For further information and literature, write to British Industries Corp. International Machinery Div., 164 Duane St., New York 13. Division J & S 540. **T-11-791**

Rotary Table

The Ohio Machine Tool Co. has developed a rotary table which features a hydraulic clamping and raising device built into the table, and which is self-contained and controlled by a push-button panel at the operator's position. The table is accurately graduated in ½ degrees and is furnished with a precision indexing unit, consisting of precision dial indicator and adjustable stops.

The table size is 84 x 96 in., with an overall height of 27 in. It weighs approximately 37,500 lb, has a load capacity of 150,000 lb.



Non-metallic bearing surfaces between table top and base is another feature of the table unit. Lubrication has been given special attention and is by means of a pressure system with metered units at each oiling point, circulating system by pump and some transmission units run in oil.

The hydraulic lift system to the table top insures easy positioning of the job for the various machining operations. Often the construction of certain jobs makes it necessary to set the job on one side of the table so that the weight is not equally distributed. When such a condition exists on ordinary revolving tables, considerable sag and deflection occur on the table top, making adjustments difficult and sometimes impossible. With the hydraulic lift feature on the Ohio table, this condition has absolutely no effect on the ease of operation even under the heaviest loads.

For additional information, write The Ohio Machine Tool Co., Kenton, Ohio.

T-11-801

Finishing Compound

A special-purpose chemical for barrel-finishing brass, bronze, copper, gold and silver stampings, castings, machined and drawn parts is offered under the trade name Blue Magic Compound No. 1 Double Strength. This compound is a highly concentrated paste for use in very small quantities and is said to yield uniform metallic colors and finishes in short time cycles.

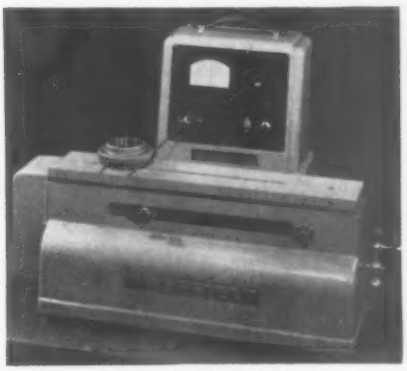
Blue Magic No. 1 is recommended by the manufacturer for finishing either with or without media, and with selected non-ferrous media for roughing, deburring, cleaning and finishing in a single operation. Recommended quantities are only 4 oz of compound for finishing runs in a 32 x 30-in. tumbling barrel at high water level. As a cutting compound in deburring operations only one or two oz of compound is needed at low water level in the barrel.

Write to Blue Magic Chemical Specialties Co., 2135 Margaret St., Philadelphia 24 for bulletin No. 1.

T-11-802

Electronic Gaging Head

A remote electronic gaging head is now being supplied with the N-6 Internalchek according to an announcement by The Sheffield Corp. of Dayton 1, Ohio. Standard dual amplifications are 1,000/2,000, 300/3,000, 5,000/10,000 to 1. Other amplifications are available on special order. This instrument is normally used in the tool room or gage laboratory for checking master and working ring gages, setting snap and length gages, for checking tools and other high precision work having one or more internal dimensions. It is also ideal for use where small runs are made of a great variety of bore sizes which have close tolerances. Precision blocks or masters are used as a reference in setting up the instrument. Both bench-type and console base are available.

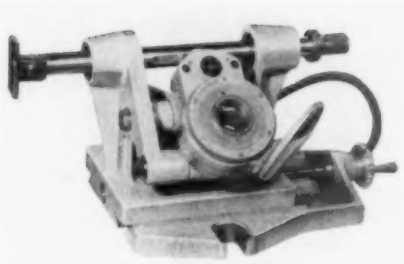


The Sheffield electronic gage head consists primarily of a highly stabilized a-c vacuum tube circuit which gives indication on a high-speed meter. A built-in regulating transformer controls fluctuations of 95-125 volts to within 1 percent, assuring extra long life of tubes. The elimination of drift in the circuit permits accurate measurements continuously or intermittently, over long periods of time, without constant resetting. The scale is linear on both sides of zero.

The N-6 has a wide gaging range from a minimum diameter of 0.370 in. to a maximum diameter of 12 in. Maximum gaging depth from surface plate to center of diamond point is 1½ in. By turning the part over, another 1½-in. depth of the hole may be checked, making it possible to explore a hole 3 in. deep throughout for diameter, taper, bell mouth, and out-of-round conditions. Capacity of the standard instrument is sufficient to accommodate an A.G.D. ring of the largest size. On special order the N-6 may be supplied with gaging arms for checking holes down to and including 0.240 in. in diameter. The maximum gaging depth from the surface plate to center of diamond points on these arms is one inch. **T-11-811**

Optical Cam Rise Gage

The cam rise gaging device shown is designed to measure cam contours (both angle and amount of eccentricity) by optical means, and to simplify and speed up accurate eccentricity measurements. The deviation in a cam surface at any angle of arc, from minimum to maximum radii, can be measured to ten thousandths of an inch. Reading is direct at normal eye distance, no focusing is necessary and errors inherent in mechanical gaging devices are eliminated. Because of its simplicity the chances for human error are reduced to a minimum.



For angular measurements, the cam rise gage is used with a dividing head and tail stock to position the cam. The gage consists of a base for positioning and securing the instrument, a screw adjustment for moving the optical system into contact with the cam surface, a contact bar and cam follower that are held against the cam by adjustable weight tension, a scale and a microscope.

A linear scale, engraved on the contact bar, is graduated from 0 to 3 in. in increments of 0.050 in. The microscope enlarges these divisions, and each 0.050 in. can be divided so that direct readings can be made to 0.0005 in. and movements as small as 0.00025 in. can be easily and accurately estimated.

For bulletin write to F. T. Griswold Mfg. Co., Wayne, Pa. **T-11-821**

Full-Revolving Derrick

The Clyde Iron Works, Inc., Duluth, Minn. announce an addition to their line of material handling equipment—a self-contained, full-revolving steel derrick. It is available with either gasoline or electric power and can be swung by hand or power.

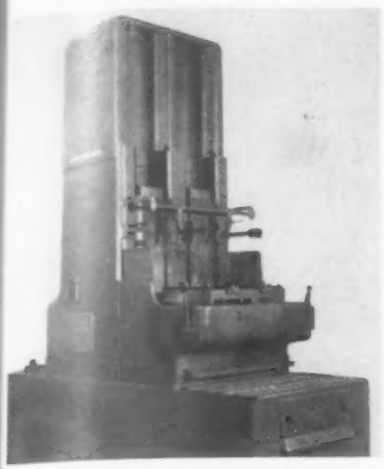
Having a short tail swing of but 5 ft. 6 in. and requiring no stiff-legs or guy lines, it occupies a minimum of ground space which permits it to be set up and operate in congested areas.

The rotating structure which supports the boom and boom supporting members also supports the hoisting machinery. This helps provide counterweight for additional stability when swinging loads. The complete rotating structure is centered on a cast steel turntable by means of a bronze-bushed center pin and is supported by four double-tapered, anti-friction bearing rollers.

Boom lengths of 20, 30 or 40 ft are available with load capacities from 2000 lb at a 40-ft radius to 10,000 lb at a 10-ft radius.

This machine is particularly adapted for use at loading or unloading stations, handling materials at docks, railway terminals, lumber yards, monument works, barges, for setting steel on construction jobs and for general utility work around industrial plants.

Additional information on Model W-3 can be obtained by writing the maker. **T-11-822**



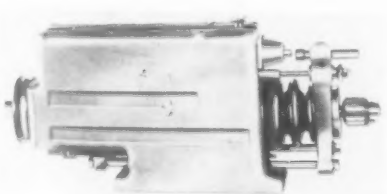
Hydro-Broach Machine

An improved duplex (double ram) vertical hydrobroach machine was recently announced by The Cincinnati Milling Machine Co. These machines are currently built in 5 and 10-ton sizes (broaching force), 42 or 54-in., and 54 or 66-in. stroke, respectively.

The chief advantage offered by the improved design is in the table construction. The rams operate alternately up and down, cutting on the down stroke. In front of each ram, an individual table advances to cutting position and retracts to loading position, synchronized with the movement of the rams. These tables operate over long square gibbed bearing ways, hardened and ground, and automatically lubricated. The tables and rams are actuated hydraulically. Dovetail clamping strips, located in accurately machined slots, clamp the fixture to the table. The table is exceptionally heavy, and provides ample thickness for drilling and tapping clamping screw holes, if they should be required.

Protection of the hydraulic pump and valves is provided through fine-mesh intake strainers and a filter connected in parallel to the hydraulic circuit. When the pressure on the filter increases to a pre-determined value, a pressure gage, visible from the operators' working position, serves as an indication that the filter is becoming clogged and should be replaced.

T-11-831



Drilling Units

Two drilling and tapping units are announced by Locke Gage Co., 10232 Woodward Ave., Detroit 2, Mich.

Shown above is a heavy-duty model (4000 Series) with self-contained power source including two-cycle refrigerator-type compressor, permitting pressure adjustments from 0 to 500 lb. This unit is capable of drilling holes up to $\frac{5}{16}$ in. in diameter in alloy steel or equivalent.

The second unit is a light-duty model (4000 S-A series) which employs shop air for power against a 3-sq-in. piston surface. This unit is capable of drilling holes up to $\frac{1}{4}$ in. in diameter in mild steel or equivalent.

Both Locke units feature "positive-control" drilling and are completely automatic, eliminating the use of gears, brakes or clutch. They have identical hydraulic check mechanisms that permit "control cycles" and have built-in electrical solenoids that start drill unit action.

Positive hydraulic control over thrust makes possible half-hole drilling and starting the drill on angular surfaces. Spindle travel is 3 in., of which any fraction may be used at any place within the overall spindle travel. Construction of the hydraulic checks makes it possible to mount the units at any angle and still assure flow of oil from reservoir to restricting chamber.

Both units are enclosed in the same dimensional case ($3\frac{1}{4}$x$7\frac{5}{8}$x$18\frac{7}{8}$ in. long). This enables them to be used conveniently in multiples as well as singly.

T-11-832

Automatic Feed Router

Onsrud Machine Works introduces the Onsrud InvoMill, an automatic, electronic-controlled power feed router and skin mill.

It permits routing of thicker stocks of aluminum and other non-ferrous metals than heretofore possible with standard hand-feed routers. It is of particular importance in the making of grids which hold gas tanks and other parts inside aircraft wings.

A 30-hp motor supplies ample power for routing aluminum stock of 1 in. or more in thickness. This work capacity is especially interesting to aircraft manufacturers in view of the trend by aircraft designers to thicker stock for greater structural strength, wider latitude for design improvements, more economical assemblies, etc.

The Onsrud InvoMill also acts as a dual-purpose machine, handling skin milling of large aluminum pieces used to form wings. A 40-hp, 5400-rpm direct-driven, liquid-cooled motor, mounted on the cross rail, provides all the power necessary for tough milling work. Both motor and cross rail may be tilted to varying degrees, providing a combination of angles without the use of sine plates.

Three table widths, 72, 84 and 96 in., are available for routing or skin mill applications with bed lengths furnished in multiples of 15-foot sections plus 7 feet for conveyor.

Information about this new machine may be had from Onsrud Machine Works, Inc., 3900 West Palmer St., Chicago 41, Ill. T-11-841

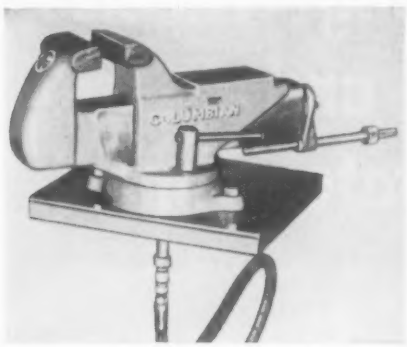
Magnesium Safety Tongs

Magline, Inc., announce an addition to their line of lightweight magnesium safety tongs. The principal feature of the new model is a tapered nose unit designed to facilitate handling of small stock. Weighing 2½ ounces, the new tongs reduce worker fatigue and aid in keeping press and shear feeding operations at peak efficiency. Manufactured from specially alloyed magnesium, the safety tongs are designed to crush if accidentally caught within the die opening, thus eliminating possibility of damage to costly dies. In addition to their lightness, the safety tongs give positive rigidity and long service life. Information is available from Magline, Inc., Pinconning, Michigan.

T-11-842

Hydraulic Vise

A 4-in. jaw fast-operating hydraulic machinists' vise is announced by The Columbian Vise & Mfg. Co., Cleveland 4, Ohio. Known as No. 1004, this vise is substantially heavier than previous models and possesses higher and wider jaws.



Maximum hydraulic pressure is 7,000 psi and maximum jaw pressure is 4,000 lb. A safety valve protects against overloading. The manufacturer advises that jaws can be closed without damaging the lightest castings or finished surfaces. Vise closing speed is ⅞ in. per pump stroke. Full vise opening can be accomplished in 3 seconds.

Use of the hydraulic vise permits operators to employ both hands to handle and position materials and in finishing work. The vise is controlled by two simple foot pedals—one for power, the other for release. Stop control is adjustable so that any production work is gripped and held with a single power stroke. **T-11-851**

Tumbling Machine

The Grav-i-Flo Corp., Sturgis, Mich., has added a new model tumbling machine to its line of equipment for use with the Grav-i-Flo tumbling process. With two 18-in. x 40-in. ID compartments, the model 36-2 machine offers increased capacity per area of floor space over previous equipment.

Other features are: compartments with ½-in. plate unlined or ¼-in. plate rubber-lined; doors have cam locks with manually-released safety stops to provide pressure relief; magnetic starter has a reduced voltage control to meet plant electrical standards. A lever is standard on the machine but a push-button switch is optional; a limit switch on the safety guard cuts off current to stop barrel rotation when guard is lifted. The 220/440-volt, 5-hp motor has a magnetic brake. Water and electrical services are integral with the machine. Safety guard is counterbalanced for easy lifting. Hoist pan has tubular yoke with unusually operated lock.

For information about this machine write the manufacturer. **T-11-852**

Collar Edging Rolls

Collar edging rolls, developed by Niagara Machine and Tool Works, Buffalo 11, N. Y., prepare a round sheet metal pipe for joining with a flat sheet. The contour of the rolls raises a substantial bead above the surface of the pipe and at the same time crimps the edge so that it is smaller than the pipe diameter. The crimped side of the bead is flat so as to provide a good seat for the sheet. Due to the unusual height and shape of the bead, the diameter and concentricity of the hole in the sheet cut to receive the pipe is not especially critical. Also, the crimped edge can easily be peened over to form a tight joint with the sheet.

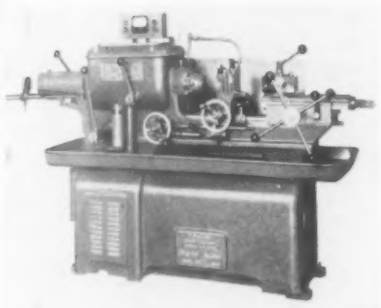
The rolls are made of alloy steel, hardened and polished. They are available for the #164 Universal rotary machine using 24-gage mild steel maximum, and for the #172 Electric combination machine using 20-gage maximum. **T-11-861**

Work Positioner

The Wilton Tool Mfg. Co., 925-941 Wrightwood Ave., Chicago 14, is offering the Powrarm work positioner. The Powrarm permits assemblies to be placed at any angle on a 360-deg horizontal plane, 180-deg vertical plane and 360-deg axial plane, or in any combination of positions. The fixture holds the work firmly in the desired position and permits the operator the free use of both hands. For further information, write the manufacturer. **T-11-862**

Turret Lathe

A high-precision No. 2 turret lathe, with 1¼-in. bar capacity, utilizing standard assemblies and eliminating complex devices required only for rare operations, is now being built by Simmons Machine Tool Corp., Albany 1, N. Y. The lathes are designed for rapid production of precision parts and a variety of bar and chucking operations. They feature remote speed control, helical gears in the headstock, and an electrical tachometer that indicates spindle speed.



Simmons Micro-Speed Drive permits an infinite range of speed changes while the spindle is in operation in either direction. The Micro-Speed drive consists of a unitized a-c motor and variable speed drive mounted on a hinged bracket in the one-piece cabinet base.

The spindle is mounted so that opposed anti-friction bearings on the head end control longitudinal adjustment. The straight, precision roller bearing on the rear end allows for expansion without disturbing the spindle adjustment. Spindle drive is obtained through standard, separable-link Vee-belting. Excessive stretch is taken up by the removal of one or more links.

The spindle clutch, valuable in short-cycle operation, is a standard make of the multiple-disc type, readily adjustable for wear. A simple, oversized brake operated by the clutch lever brings the spindle to rest quickly; locks it idle for changing work.

Power feed to the turret ram is provided through a three-speed gear box, and a worm and worm wheel mounted on the turret saddle. **T-11-871**

Power Press

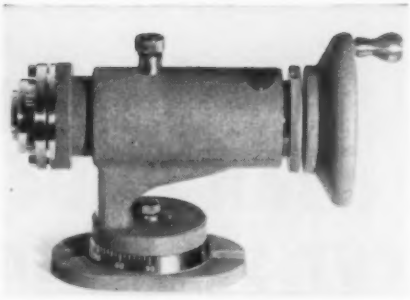
Famco Machine Company of Racine, Wisconsin, announces the addition of five deep-throat models to its line of open back, inclinable power presses. The new models are rated in 5- and 8-ton capacities, will take work 20 in. and 24 in. in diameter, and offer four shut heights from 6 in. to 13 in. with up to 3-in. strokes.

Further details about the new Famco deep-throat presses may be obtained by writing the manufacturer. **T-11-872**

Relief Grinder

Developed to handle a wide variety of work countersinks of all types, center drills, integral pilot cutters, and right- or left-hand pilot drills, the I-G-C relief grinder is designed to operate at maximum efficiency by unskilled help. With only two wrenches, the fixture is easily adjusted for the correct relief and angle in relation to the grinding wheel.

The I-G-C fixture fits any standard grinder, and will handle work from 1/16 in. to 1 in. in diameter with standard collets. The lift of the single cam is variable from 0.001 in. to ⅛ in. and adjustment pins are provided for 1, 2, 3, 4, and 6 fluted cutter grinding.



By a quick change of collets, angle of fixture and the lift cam, the I-G-C fixture is easily set up for various types of grinding operations. Cutting edges are ground equally, thus reducing frequency of grinding.

Constructed to insure permanent accuracy, the I-G-C relief grinder's main housing is made of cast iron which supports a hardened and ground spindle on two large bearing surfaces that require only periodic oiling. The cam is hardened tool steel with steel adjustment pins. Fixture swings 90 deg to the right or left; base is calibrated in 5-deg increments.

For information write to Western Aero Industries, 3305 Burton Avenue, Burbank, California. **T-11-881**

Nylon Bearing

Thomson Industries, Inc., Manhasset, N. Y., has developed the Nylined bearing, which consists of an outer sleeve of inexpensive metal and a relatively thin lining of nylon bearing material. The nylon liner is retained in the outer sleeve in a manner which will permit it to expand and contract circumferentially around the inner periphery of the outer sleeve. The liner is provided with a narrow slot, or compensation gap, which interrupts the circumference. In applications where lubricants can be used, one or more annular grooves are provided on the inside of the outer sleeve to form storage wells for grease or other lubricants which are evenly distributed through the compensation gap.

The Nylined principle eliminates the need for wide clearances which are necessary in plain nylon bearings to compensate for dimensional changes due to thermal expansion and moisture absorption. Dimensional changes in the Nylined liner are taken up by the compensation gap with no appreciable effect on the diameter.

There is no danger of seizure due to stress deformation which can distort the bore of most plastic type bearings. Internal stresses in the thin section liner are negligible, and any slight tendency to change is taken up in the compensation gap.

Closer fits possible due to the Nylined principle afford uniform load distribution over the working surface, assuring greater load capacity and life.

Nylined bearings can be furnished in the plain sleeve type or the flange type. When substantial thrust loads must be carried in addition to radial loads, the bearing is usually laid out to provide a separate surface of nylon-bearing material to take the thrust. Since Nylined bearings can be quickly fabricated to special dimensions without expensive or elaborate molds or dies, they can be furnished on a custom basis, designed expressly for each application. **T-11-882**

Tapping Machine

To facilitate precision-tapping of a number of same-size holes on one or more levels in bulky pieces where use of multiple tapping heads is not practical, The Cleveland Tapping Machine Company, Canton, Ohio, is now offering its Type ER compound-table tapping machine.

Moving freely on ball-bearing raceways, the 28x42-in. work table has a lateral travel of 20 in. to either side, 13 in. forward travel and 11 in. backward travel from the normal standard position. This makes it possible to center any hole in a 24x40-in. workpiece directly under the tap. A push-button-controlled solenoid brake locks the table in any transverse and longitudinal position and holds it until released by pushing another button. The solenoid is designed so that it cannot overheat regardless of the length of time the brake is applied.

A motor-operated raising and lowering system, controlled by "up" and "down" levers, gives the table 18 in. vertical travel, with table top 56 in. from floor at maximum height. The elevating system consists of three Acme thread screws and ball-bearing mounted bronze nuts driven through steel sprockets by a continuous double roller chain to assure synchronization of the operation of all three screws.

The base of the machine is 64x38 in. The column, 25x20 in., is 100 in. high approximately, with 26½-in. throat depth to permit handling of work pieces overhanging the back of the table. Top of the table is precision-machined and provided with four Tee-slots for mounting jigs, fixtures and clamps.

T-11-891

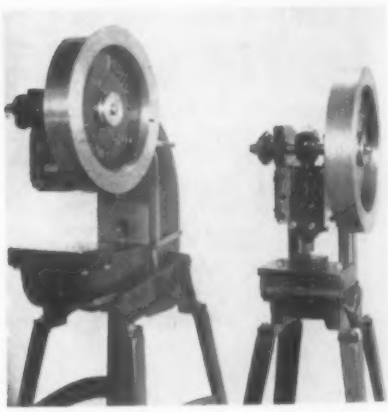
Metal Parts Cleaner

The Magnus Chemical Company, Garwood, N. J., announces a new cleaner for all kinds of metal parts, Magnus 751. It is safe for all metals, not attacking, pitting or marring aluminum alloys, bearing metals, cadmium, solder, die cast or any other soft metal. It is non-inflammable. It cleans at high speed, penetrating, loosening and removing all foreign deposits. Magnus 751 can be used in either hot or cold solution and is followed by a simple cold water rinse after the cleaning period.

This cleaner can be used for the removal of carbonized oil and gums from aircraft engine parts, diesel engine parts and other units. It is also recommended for cleaning carburetors, fuel pumps, pistons, rocker arm assemblies, rear and transmission parts, brake parts, etc. **T-11-901**

Five-Ton Punch Presses

Two five-ton power presses with ram speeds suitable for deep drawing, piercing and blanking operations, have been developed by the Kenco Manufacturing Co., 5211 Anaheim-Telegraph Rd., Los Angeles 22, Calif.



A massive 18-in. diameter, 110-lb. flywheel supplies the momentum needed for the slow-speed operation, while ram speeds can be varied from 95 to 280 strokes per minute by adjusting the ¾- to 2½-in. diameter of the variable-speed motor pulley.

Features include a one piece, 1⅞-in. crankshaft, a 1-in diameter clutch drive dog built into the clutch collar instead of milling the crankshaft, extra large Vee-type ram guides, over-size ram area, adjustable motor bracket, an adjustable brake facility for switching from single to repeat operation instantly, without stopping the motor, an adjustable bed (4-in-1) that permits conversion to a long, half, or horn type punch press, and a deep 12¾-in. throat (4-in-1) that permits punching to the center of a 24½-in circle. **T-11-902**

Alloy Metal Welder

"Fillerweld," a product designed to speed alloy-metal welding on applications where filler-metal must be added, has been announced by General Electric's welding department.

Used with gas-shielded arc welders, Fillerweld allows the operator to control the continuous flow of filler-metal automatically by means of a finger switch mounted on the torch. The new welding attachment allows the operator to start or stop the flow of filler metal without breaking the arc, resulting in a smoother, faster weld.

Fillerweld consists of two main elements—the torch or "gun," and a mechanical power unit. The gun is basically a manual water-cooled Inert-Arc tungsten holder to which has been added a control switch, and a gear assembly for pulling the filler-metal from the spool to the arc through the gun. Rated at 250 amperes, the gun accommodates tungsten from 0.040 to 5/32 in. in diameter and up to 7 in. long.

The mechanical power unit consists of a motor which provides the power for drawing the filler-metal, a Thy-motrol unit for controlling the motor, and a spool which holds the filler wire. The unit is mounted on a portable platform and can be moved easily from job to job. **T-11-911**

Automatic Press Feed

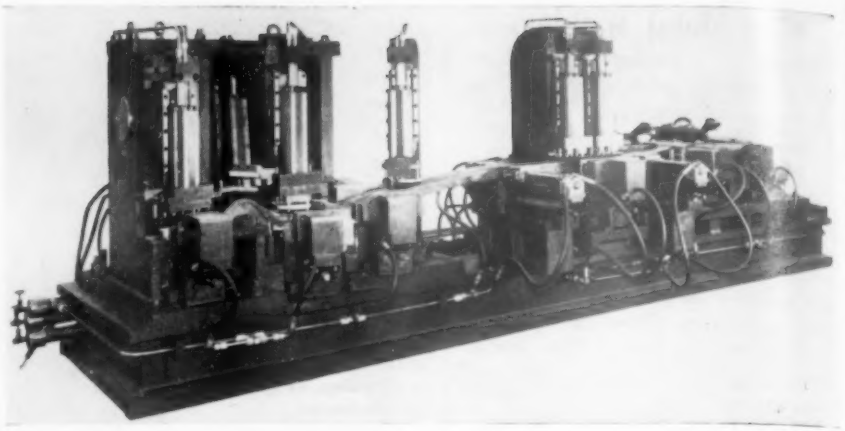
The Producto Machine Co., Bridgeport 1, Conn., has developed a positive-action automatic feed called the Surefeed. It is simple in design, rugged in construction, easy to mount and quickly set up for required feed length.

Any ordinary press can use the die set, no press attachments or alterations are required. Stock up to 2 in. wide and 0.045 in. thick can readily be advanced by this feed through movement of the press. Bulletin available on request from the company. **T-11-912**

Hydraulic Machines

To facilitate the piercing and sizing of holes, and to simplify many other special operations, Danly Machine Specialties, Inc. of Chicago has announced the manufacture of a new line of hydraulic metalworking equipment.

Originally patented by the Mueller Engineering Co. of Dearborn, Mich., these hydraulic machines are finding increasing applications in the automotive and aircraft industries. Typical operations are simultaneous piercing of all holes and the trimming of automotive frame members, production-riveting assembly operations on automotive



frames, and producing accurately pierced holes and related assembly operations for jet engine components.

This wide range of applications is said to be due to the special features contained in the hydraulic cylinder—the basic unit of the machine. Built-in blankholding and stripping action, which is entirely automatic and requires no springs, is actuated hydraulically after the power stroke. It is said that the inherent compactness and rigidity of this construction permits producing holes under difficult conditions, such as punching steel that is thicker than the hole diameter.

Principle features of the hydraulic system include continuous pressure intensification which permits wide flexibility in adding cylinders in the circuit of the power unit. A patented transfer valve permits handling extremely high pressures while eliminating hydraulic shock in the circuits. These features are the basis for capacities up to over 200 tons in relatively small compact cylinders. Other applications for these hydraulic machines are found in small piercing units and riveting machines.

For further information, write to Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, Ill.

T-11-921

Expansive Bit

An expansive bit, featuring a one-piece shank, is being manufactured by the Robert H. Clark Co., 9330 Santa Monica Blvd., Beverly Hills, Calif.

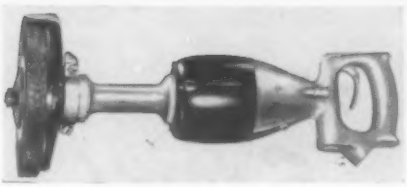
This Clark tool cuts clean holes in hard or soft wood from ½ to 3 in. in diameter. The cutting blade requires less pressure, seems to pull itself through the wood quickly and accurately. Moreover, the fine tool-steel blades hold their edge longer, are easily adjusted, and the positive lock prevents blade slippage. Blade is tilted, eliminating the center lip, for easier, more accurate cutting. The self-clearing lead screw is of the constant-feed, no-loading type. **T-11-922**

Air Grinder

An air grinder, announced by Ingersoll-Rand, has an added safety device to prevent overspeed operation and possible accidents. It has special application in foundries, steel mills, general manufacturing and metalworking plants where hand grinding is required for snagging, trimming, smoothing, etc.

The grinder contains a motor governor to maintain correct wheel speed, plus a built-in unit called the "overspeed safety coupling". In case the motor overspeeds because of governor wear, abuse, maladjustment or dirty air, the "overspeed safety coupling" automatically uncouples the arbor and the grinding wheel from the motor, making it impossible to operate the grinder until the cause of overspeeding has been corrected.

The operator can choose any one of four exhaust positions, spaced 90 deg



apart, and thus direct the exhaust away from the work and from his own body, if he desires.

The grinder is available for 8-, 6-, or 5-in. wheels, running at respective motor speeds of 3100, 4100 and 4500 rpm. Overall length is 24⅝ in. with straight handle and 22½ in. with grip handle. The grinder has a maximum side-to-center distance of 2 5/16 in. and weighs approximately 16½ lb with guard.

Further information can be obtained from Ingersoll-Rand Co., 11 Broadway, New York 4. Ask for Bulletin 5096.

T-11-931

Drum Switch

Announcement is made by Allen-Bradley Company, Milwaukee, Wisconsin, of a reversing drum switch—Bulletin 350 Style A—suitable for a wide variety of mounting arrangements for small workshops and industrial services.

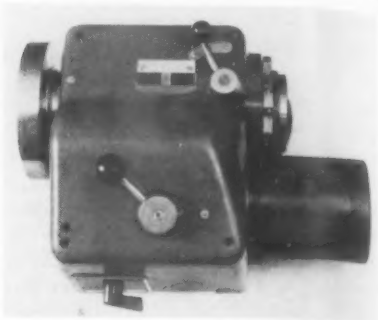
The Bulletin 350 Style A drum switch is the equivalent of a three-pole double-throw switch. It is small, simply designed—for machines and equipment requiring an economical across-the-line starting and reversing switch for a-c and d-c motors rated at two hp or less.

Housing of the new unit is bakelite and contains eight fixed contacts, a moving contact assembly, handle-coverplate assembly, and mounting screws. Contacts are cadmium silver alloy—eliminating maintenance. Wide flexibility in mounting is provided.

T-11-932

Threading Attachment

An integrally-powered lead attachment for production threading on lathes, milling machines and some plain grinders makes possible threads of greater accuracy and better finish at higher speeds.



Designed primarily as a work-holding and leading device for multiple-form cutter thread milling on lathes or milling machines, the attachment may also be used to provide the lead for multi-rib wheel thread grinding on plain grinders.

Soft materials can be threaded in lengths to 1½ times the work diameter, or 3 in. maximum if workpiece is more than 2 in. in diameter. Pitch range is from 6 to 40 tpi. Multiple threads can be produced without difficulty, provided lead is no coarser than 6 tpi.

The attachment is integrally powered by a 1/30-hp, 2-speed (750 and 1500 rpm) motor operating at a reduction of 1081 to 1. Any conventional 3-phase voltage is available.

Motor is reversible to provide for cutting left- and right-hand, or internal and external threads. Limit switches at each end of the lead indicator prevent overtravel of the spindle and a scale shows spindle position at all times, both for setup and operation. Six spindle speeds are available by various combinations of motor speed and internal gearing, shifted by a lever.

Master screw sets can be provided for all of the standard leads, and the same set is used for all forms and diameters, provided the lead is the same. Except for full-square and buttress-style threads, any form can be cut.

This device, attached to the cross slide of a standard toolroom or engine lathe, or on the table of a conventional milling machine, will convert any of these into a thread milling machine. The normal function of the machine is not impaired; the attachment is easily removed when the threading job is complete. Available from Gubelin International Corp., 35 W. 53rd St. New York 19. **T-11-941**

USE READER SERVICE CARD ON PAGE 105 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

High Pressure Triplex Pump

A high-pressure triplex pump has recently been introduced by Kobe, Inc. Division of Dresser Equipment Co., Huntington Park, California, as a heavy-duty packaged hydraulic power generator for all types of hydraulic power systems. The unit is available in 15-, 30- and 50-hp sizes with pressure ratings up to 5,000 psi and displacement ratings up to 60 gpm. Special 10,000-psi and 20,000-psi heads are available.

Features of the Kobe triplex pump include integral gears, available in a wide variety of ratios. The unit can be obtained with an integral, drip-proof Sterling electric motor drive which simplifies installation problems common to this type of pump. Plungers and liners are interchangeable. Spring-loaded balls and hardened-and-ground seats serve as inlet and outlet valves. Pressure lubrication is one of several features which also include pressure gage, relief valve, and scavenger pump. The Kobe Triplex is completely enclosed. **T-11-951**

Thread-Gaging Tool

Keller Tool Co., Grand Haven, Mich., presents a tool designed to speed inspection of the threads in tapped holes. It is air-powered, and is used in conjunction with standard taper-lock plug gages. Operation is extremely simple: press, and the motor spins, screwing a "go" gage into the hole; pull, and it reverses, backing the gage out.

The Keller thread gaging tool consists of an air motor with friction clutch and gage adapter, and weighs 34 ounces. It can easily be moved to the work, and may be suspended over the work area by a balancer if desired. For inspecting small parts, the tool may be bench-mounted either vertically or horizontally. If controlled by a foot valve, the inspector can use both hands for handling parts.

The rotary air motor turns the gage at speeds ranging up to 300 rpm. The speed is controlled by a built-in air regulator.

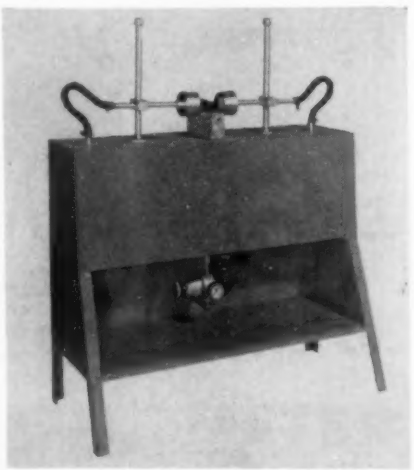
In case the threads being checked are not satisfactory, an adjustable friction-type clutch permits the gage to stop without stalling the motor.

The Gaging Tool is regularly furnished with an adapter to accommodate taper-lock gages with thread diameters from 0.510 to 0.825 in. Other adapters are available to handle gages ranging from 0.059 to 2.510 in. thread diameter. Adapters are interchangeable.

Additional information may be obtained by writing the manufacturer. **T-11-952**

Brazing Carbide Tools

A simple, speedy, and economical arrangement for brazing of carbide tool tips on tool shanks has been developed by Valley Machinery & Supply Co. Compressed air at 75 psi and manufactured or natural gas at regular city line pressure (3 in. equivalent water column) are conducted to an appropriate mixing tee. The pre-mixed gas and air from this device is conducted to a pipe tee and distributed at about 1½ psi pressure through flexible connections to each of two refractory-cup radiant gas burners of 2½-in. diameter.



Both burners are supported by adjustable clamps so that they can be directly faced (one on either side of the tool being prepared) within ¼ to ½ in. of the tool shank—the burner center-lines being at a point about 2 in. behind the end of the tool. Thus: a maximum rate of radiant heat transfer to the tool from closely spaced incandescent refractory cups at high temperature is obtained; combustion is compacted into a small space to develop a "super-heating" effect and an exclusion of secondary air from the combustion gases; heat is caused to flow toward the tool end (and the carbide tip) rather than away from it. Because the velocity of the burning gases is largely dissipated within the burner cup, there is no "blasting" over the tool, which, with certain other methods, causes the flux to be blown off the tool end before it has discharged its function in facilitating the braze.

Tips are removed and replaced on 1½-in. by 1-in. tools in 2½ minutes overall—on 2⅜-in. by 1½-in. tools in 4 minutes. The convenience of the arrangement facilitates fluxing and manipulating the braze at the tool tip.

For more complete information, write Valley Machinery and Supply Company, P. O. Box 434, Rock Island, Illinois. **T-11-961**

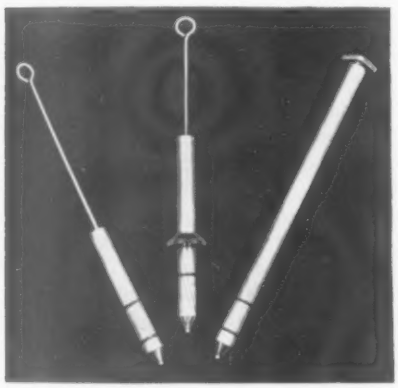
Drilling Machines

Sibley Machine & Foundry Corp. has introduced a new design of multiple-spindle drilling machine. With three spindles mounted integral to a sturdily constructed column, this Model ME-25 is suited to operator efficiency on high-volume production.

Unique among features for a machine of medium weight are its 25-in. swing, a variable-speed drive from which the exact spindle speed may be obtained for any size drill from 1/8 to 1 in., and an extra large table with coolant trough.

The ME-25 is powered by a 1½-hp axial air gap motor. Capacity of machine is ¾ in. in steel and 1 in. in cast iron. Distance between spindles is 14⅞ in. The table has a vertical adjustment of 12¼ in. The working surface of the table is 45 x 14½ in. Net weight with motors is 2165 lb.

For information on Model ME-25, write for catalog No. 70 to Sibley Machine & Foundry Corp., South Bend, Ind. **T-11-971**



Tubular Magnetools

A line of hand-operated load-releasing tubular Multilift Magnetools is announced by Multifinish Mfg. Co., Dept. 528, 2114 Monroe Avenue, Detroit 7. The magnets are used for entering small openings such as blind holes, and removing boring chips from castings. They are especially designed to remove steel chips or parts from other steel surfaces, chips from metal cutting machines, etc. Patented brass pickup tip prevents sticking.

Models in production include both large and small magnets with hand wipe-off release or the patented mechanical "pull-to-release" features. Models are also equipped with neoprene bumper rings to prevent the magnet gripping sides.

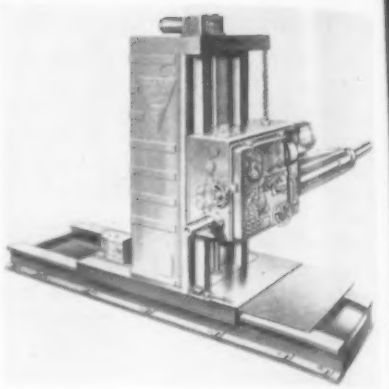
Magnetools use permanent, not electric magnets, are resistant to water, oil and gasoline. Five different models for varying job requirements are included. Diameters are 1/16, 3/8, 1 3/8 and 2 5/8 in. **T-11-972**

Drilling Machine

The Kaukauna Machine Corp., Kaukauna, Wis., is introducing a horizontal drilling and tapping machine which will drive boring fixtures and perform efficient drilling, reaming, boring, counterboring, tapping and spot-facing operations.

The box-type column is heavily-ribbed for rigidity and accuracy, and the 4-in. diameter flame-hardened spindle with 42-in. spindle travel slides in a hardened steel sleeve mounted in taper roller bearings. The spindle drive motor may be from 10 hp to 20 hp and the spindle is fitted with No. 5 or No. 6 Morse taper with 18 speed changes through sliding gears actuated by a direct-reading rotary dial selector lever.

All controls are grouped at the front of the headstock where they are within easy reach of the operator. The pilot wheel is internally clutched, overload-protected and graduated to 6 in. for depth-control drilling and tapping with automatic feed kick-out at the preselected depth. Headstock is completely counterweighted and has rapid traverse and electric inching through a power-driven screw with the head traverse motor located on the sheave bracket. Traverse rate is 80 ipm and overtravel is prevented by limit switches.



Runway slides are heavily ribbed semi-steel castings guided and gibbed to the runways and contain a 3-hp gear motor and worm reduction to traverse column along the runway. Rate of traverse is 80 ipm with electrical inching controls for fine positioning. A screw-type runway slide clamp is interlocked electrically to pushbutton controls and limit switches prevent overtravel.

T-11-981

Contour Sawing Machine

The DoAll Co. announces a general purpose contour sawing machine designated V-36-3. This machine takes continuous saw, file or abrasive bands up to ½-in. width, and features a three-speed transmission and speed-master drive providing variable tool velocity ranging from 25 fpm to 6,000 fpm. With this speed range it performs all types of conventional metal sawing or filing, high-speed cutting of non-ferrous metal and composition materials and light-gage alloy friction cutting.

The unit-welded steel frame is 81 in. high, and requires 40x76 in. floor space.

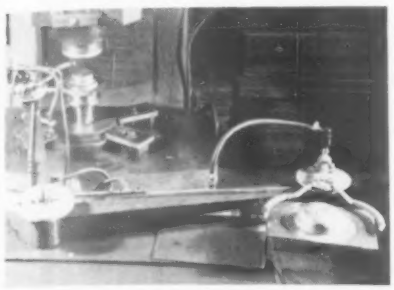
The V-36-3 is useful and economical in aircraft production, sheet metal, pattern and sign shops where its 36-in. throat capacity is advantageous. This model normally carries the saw band over three wheels but when the band becomes too short after several welds, the band may still be used to its full life over two wheels on work requiring no more than a 16-in. throat.

Equipment for general purpose contour band machining includes: built-in blade welders with squaring shear, motorized grinder and thickness gage, assorted band tools and guides, automatic power feed, job selector dials, speed indicator, dust spout, adjustable light, chip blower, etc. Cutting tools are guarded to the point of work. The machine uses a 3-hp drive motor and magnetic starter with push-button control.

T-11-982

Automatic Press Loader

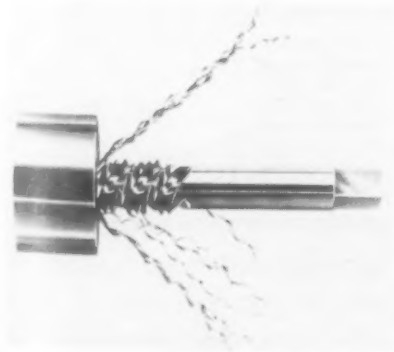
The Lodac press feeder is a development by Magnaflux Corporation which stems from numerous special automatic units for non-destructive testing with Magnaflux. With the Lodac feeder, mechanical "fingers" pick up parts after first draw and feed one or more consecutive redraw presses at speeds up to 1,200 parts per hour. Similar "fingers" remove the parts from the press to place them on another conveyor to feed further press operations.



The complete operation cycle is set by the speed adjustment of the Lodac press feeder. At the proper point after loading, the press is tripped by the feeder, with either electric or air triggering. If the part is not removed from the die, a safety circuit stops feeder and press. However, if parts are not being loaded to the die, a memory circuit will continue to operate the press and feeder, thus avoiding shutdown delays. After any shutdown, the memory circuit starts the Lodac feeder and press at the point of the cycle where it was last interrupted. The mechanical fingers are specially designed for the parts to be handled, and are held in special chucks for quick change between press runs. **T-11-991**

Left Hand Thread Broach

The Shearcut Tool Co., 7045 Darby Ave., Reseda, Calif., announces a left-hand thread-cutting broach which generates or forms a threaded hole by true broaching action. The maker claims that this thread-cutting broach is practically unbreakable because of the low torque required to form the thread, averaging about 40 percent of that required with a standard tap. The chip removed is curled in one piece, and the broach does not bind or seize in the hole. Made of high-grade steel, the Shearcutter thread broaches are precision-ground from the solid after hardening. **T-11-992**



Small Synchronous Motor

A small synchronous motor with unusual operating characteristics has been announced by Allis-Chalmers Manufacturing Company.

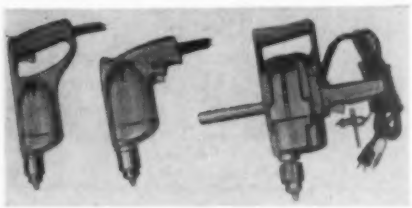
The motor, operating on the reluctance principle, has no brushes, slip rings, rotating coils or permanent magnet. It can be built to operate continuously at any voltage below 250 volts, either single-phase or polyphase, and should interest designers of control systems, instrumentation, and military and industrial equipment.

A typical motor is 4 in. in diameter by $2\frac{3}{8}$ in. long, weighs 2.6 lb, and develops 8 ounce-inch starting torque and 0.8-in. synchronous torque. Simplicity of construction provides high shock resistance and practically no maintenance.

No starting equipment is required, the motor being able to start and pull into step at any frequency from 10 to 400 cycles. **T-11-993**

Heavy Duty Drills

Portable Electric Tools, Inc., 320 West 83rd Street, Chicago 20, Illinois announces their line of PET Super-duty portable electric drills. These drills are built in different power and speed models to cover the speed and torque requirements of ¼-in., ⅜-in., and ½-in. capacity portable electric drills.



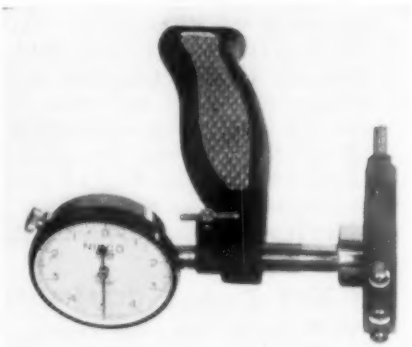
Features of these drills are: body of aluminum die castings; dynamically balanced armature; precision-cut, heat-treated alloy steel gears; forced ventilation.

The ¼-in. capacity drills are offered in standard duty, heavy duty, and extra heavy duty models with a choice of eight speeds and with a choice of either pistol grip or saw type handle. The ⅜-in. capacity drill is available in a heavy duty and an extra heavy duty model with no-load speeds from 400 to 1000 rpm. The ½-in. capacity drill is made in a standard duty, heavy duty, and extra heavy duty model with a speed range of 500 to 600 rpm.

T-11-1001

Bore Gage

Nilco pistol-type bore gage is designed to check bores on the machine by the operator where space is limited and it is impractical to use a standard-length bore gage.



The additional features on this redesigned pistol-grip bore gage include the positioning of the indicators to the proper angle so that it will face the operator at all times and the adjusting of the handle to the proper checking depth.

The gages are made in various ranges. For further information, write to Nilsson Gage Co., Inc., Poughkeepsie, New York. **T-11-1002**

North East West South IN INDUSTRY

J. O. Cavanagh has joined **Alloy Rods Co.** as technical director for the firm. Mr. Cavanagh, a veteran of 15 years in research and development of arc welding electrodes, is a graduate chemical engineer from Illinois Institute of Technology.

J. O. Cavanagh

John C. Ewer

According to recent announcement from **Norton Grinding Wheel Co., Ltd.**, England, **John C. Ewer** has been made managing director of the company. Mr. Ewer, who has served as assistant general manager of the English plant for the past year, entered Norton Company's abrasive division in Worcester in 1934.

Election of **James H. Ingersoll** as vice-president of the **Ingersoll Products Div. of Borg-Warner Corp.** was announced recently. Mr. Ingersoll formerly was assistant to the president of the division.

Warden F. Wilson recently was elected president and general manager of **Donegal Manufacturing Co.** by its board of directors. Mr. Wilson, who has wide experience in the steel industry during the past 25 years, was also elected a director of Donegal.

Wallace B. Quail has been appointed director of the iron and steel division of the National Production Authority. Mr. Quail, who is on leave from his post as manager of the central area of **Armco Steel Corp.**, was previously staff assistant to the director.

The first award of an annual gold Standards Medal has been made to **Dr. Paul G. Agnew**, authority on standards and consultant to the American Standards Association. Dr. Agnew, who has spent 45 years in standards work, served as administrative head of ASA from the time it was founded in 1919 until his retirement to consultant status in 1947. Formal presentation of the medal, which is in recognition of service and leadership in the cause of standardization, was made at the second National Standardization Conference October 22-24.

Thomas L. Lord, former president of **The C. F. Pease Co.**, died recently following a heart attack while at his summer home in Wisconsin. Mr. Pease, who invented the automatic washing and drying machine for producing blue prints continuously, joined the Pease firm in 1910, and became its president in 1922, a position which he held until his retirement in 1945.

Coming Meetings

Nov. 8-9, annual national conference on industrial hydraulics under the sponsorship of **Illinois Institute of Technology** and **Armour Research Foundation**; Sherman Hotel, Chicago.

Nov. 19-20, 52nd annual convention **National Metal Trades Assn.**; Palmer House, Chicago.

Abstracts of Foreign Technical Literature

By M. Kronenberg

Great Britain: It is evident that, although jigs and fixtures vary considerably in design, many of them possess common features and often some of the parts are identical or can be made identical. The logical conclusion is to develop standard designs of such parts and to manufacture and keep a stock of such parts so that they can be drawn out at will.

J. B. Purefay, in an article in *Engineering* of August 31, presents a discussion of the technical problems involved in building up standards for jigs and fixtures and manufacturing them from standard components. The standards developed by him include cast iron sections for jig bodies, H-, U- and T-sections, angle sections, clamping devices, swing bolts, eccentric locaters, thumb screws, jig plates, quick release nuts, plain clamps, slotted clamps, swinging latches and other such items. Basic parts also have been developed for milling and turning fixtures. The author claims that considerable time can be saved in engineering office and tool room when designing and manufacturing fixtures and jigs in this way.

A survey of hydraulic rotary drive and control systems employed in present machine tool design is contained in an article by H. C. Town published in the British edition of *Machinery* of August 16 and September 6. The author shows that there are three possible drive arrangements where a constant speed input is assured in each case. He compares American, British and German machines. The paper deals also with vane type units, speed control from a surfacing screw, hydraulic operation of reciprocating motions, hydraulic drives to feed screws, servo control and a drive for a reactive wire drawing machine.

Switzerland: Numerous investigations of the temperature at the cutting edge of lathe tools have been made in the past thirty years since E. G. Herbert of England and K. Gottwein of Germany first published their findings. They utilized the thermocouple effect of tool and work (chip) for measuring the temperature at the tool, a method which has later been adopted by many others investigating the temperature phenomena at the cutting edge. The question as to whether thermo electrically measured

temperatures give a true picture of what is happening at the cutting edge has, however, not been raised until recently.

In a noteworthy article published in *Industrielle Organisation*, Erich Bickel and his assistant, M. Widmer, present data of experiments made in the machine tool laboratory of the University of Zurich. Differences of as much as 300 deg F were found between the actual temperature (1040 deg F) and the thermoelectrically measured temperature (1340 deg F).

The authors employed a novel method for determining the true temperature by measuring the decomposition of a compound by an electric current. This compound was contained in a bath modelled to the contour of a section of a lathe tool.

Bickel and Widmer concluded that the small variations in the contact area between chip and tool—which always occur in the cutting operation—cause substantial variations in the thermoelectrical conditions and in this way render the measurements unreliable. Other conclusions from this research work may affect our present concept of the cooling and lubricating effect of cutting fluids. They take objection to the widely accepted theory of chip flow according to which no fracture or open space exists ahead of the cutting edge and claim that such a fracture actually does exist. This latter opinion would agree with a theory sometimes held by cutting fluid manufacturers who attribute the action of the cutting fluid to the penetration of the fluid into that open space.

Stresses and strains in a spot welded joint loaded in shear are very complex and depend, according to an article by H. Zschokke and R. Montandon in *Schweizer Archiv* of September 9, 1950, on width, thickness, overlap of sheet or strip, progressive deformation. They have developed formulas for welding design permitting calculation of the strength of a given spot welded joint which may be evaluated in form of numerical tables adapted to current welding practice. The influence of the material, shape, single and double lap and the change in strength due to welding heat have been taken into consideration.

France: During the past years new types of grinding wheels have been developed with various degrees of porosity, according to a report in *La Machine Moderne* of April, 1950. This process, developed by Mayer and Schmidt, makes it possible to obtain a porosity up to 70 percent, leaving 30 percent of solid constituents in the wheel. Numerous advantages are claimed for these wheels such as better

(Continued on page 104)

Abstracts of Foreign Technical Literature

(Continued from page 103)

grinding surface, higher specific output, better tool life, reduction in heat developed in the grinding operation and absence of vibration.

Germany: The compression which a chip undergoes in longitudinal direction and its expansion in width and breadth has been used for a long time as a means for determining certain characteristics of chip formation. A German contribution to this topic has been published by W. Leyensetter in *Zeitschrift des Vereins Deutscher Ingenieure* of May 13. Using the inverse of the value adopted in the USA known as the chip ratio, the author indicates that the compression of the chip differs considerably for high speed steel and carbide tools and is affected by cutting speed, rake angles, grade of carbide, condition of the cutting edge, etc.

The maximum chip compression occurs at about 150 ft/min cutting speed in the case of .15 percent C-steel and decreases rapidly as the speed is increased or decreased. It was also found that chip compression is less with a tool which is "broken in" rather than with a newly ground tool. Reduction in rake angle usually increased the chip compression. A fundamental disadvantage of parts manufactured according to the principles of powder metallurgy lies in the limitation in size and shape of the workpieces, as indicated in an article by G. Naeser and F. Zirm published in the October 26, 1950, issue of *Stahl & Eisen*.

In their investigation of so-called R-Z powder, the authors found a simple method for continuous rolling from powder. Piled up between two horizontal rolls the powder is compressed when passing between the rolls by friction. Strips manufactured in this way are sintered and display good mechanical properties which can be further improved by repetition of the rolling operation.

W. Frede reports in *Werkstatt & Betrieb* of November, 1950, about an inexpensive method for measuring motions of machinery, and similar operations in the machine shop by employing a Leica Camera equipped with a magnetic switch. Exposure can be remote controlled and the timing and cycle of repetition adjusted to the requirements of the movements.

THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

LITERATURE NUMBER	COMPANY	BULLETIN	DESCRIPTION
A-11-114	Adamas Carbide Corp.	Catalog A851	"Aid to Carbide Users"—Illustrated booklet detailing the best method of brazing carbide tool tips and wear resistant parts.
A-11-148	Alloy Rods Company	Bulletin 2519	Describes grade selection of Tool-Arc electrodes for tool and die steel.
A-11-10	American Broach & Machine Co.	Circular 300	Describes American's Vertical Hydraulic Surface Broaching Machines.
A-11-17	Ampco Metal, Inc.		Literature giving descriptions and general applications of Ampco Metal.
A-11-28	F. E. Anderson Oil Co.		"Lusol-the all-chemical Metal-working Solution" discusses advantages and main features of this cutting oil.
A-11-136	The Atrax Co.		Complete catalog on precision ground-from-the-solid end mills, rotary files, boring bits, reamers, burs.
A-11-172	Balas Collet Mfg. Co.		Catalog and price list covering line of Balas collets.
A-11-117	Bay State Abrasive Products Co.		"Big-Three" catalog containing data on mounting instructions, recommend speeds, charts, specific applications, etc.
A-11-27	Behr Manning Corp.		"Blueprints for Production" booklet describing Behr-Manning's ideas, methods and equipment, etc.
A-11-168	The Bellows Co.	Bulletin T-85	Bulletin discussing line of Rotary Feed Tables.
A-11-145	Charles H. Besly & Co.		Manual containing latest data on tap selection and application and best tapping procedures.
A-11-128	The Cleveland Tapping Machine Co.	Catalog T-9	Production tapping guide available in addition to the catalog of company's line.
A-11-4	The Cincinnati Shaper Co.	Catalog S-6a	Illustrated catalog describing Cincinnati Shears in capacities from 12 gauge to 1¼ inch steel plate, in 4 foot to 24 foot lengths.
A-11-25	Cosa Corp.		Catalog illustrating company's New Studer Profile Grinder.
A-11-152	The Cushman Chuck Co.	Catalog PO-64	Contains complete data on all company's line.
A-11-100	"Die Techniques" Publishers	Bulletin 77	Discusses information in compact handbook on dies.
A-11-159	The DoAll Co.		"Cool Grinding" catalog shows Precision Grinders for every requirement.
A-11-169	The DoAll Co.		Bulletin describing company's line of Band Machine and what they can do for you.
A-11-130-1	The Eastern Machine Screw Corp.		Various catalogs describe "Selecting Proper Die Head for the Job", Style MM, Style DMS, Style DM, and Style TM machines for cutting screw threads.
A-11-82	Golconda Corp.		"The Story of Sta-Sharp Diamond Tools" gives full details and prices on Golconda's diamond tools.
A-11-124-3	Grobet File Company of America	Catalog HC1	Catalog sheet treats Grobet chatterless countersinks.
A-11-119	Hannifin Corp.		Catalogs describing company's Pneumatic and Hydraulic cylinders, design features, styles, construction, etc.
A-11-3	Hardinge Brothers, Inc.	Bulletin "S"	Bulletin gives performance features, and information on master feed fingers and pads.
A-11-149	Haynes Stellite Co.		"Haynes Stellite Metal-Cutting Tools"illustrated booklet gives information on chip formation, tool wear and the machinability of metals.
A-11-84	Howe & Fant, Inc.		Literature covers company's Lign-o-matic turrets.
A-11-166-4	Kaufman Mfg. Co.	Catalog 1150	Catalog gives information on precision tapping machines.

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A-11-24	Keller Tool Co.		"The Hole Story of Keller Airfeedrill", descriptive booklet on company's line of pneumatic tools.
A-11-77	Kempsmith Machine Co.	Bulletin 127	Bulletin describes Kempsmith's LH Miller.
A-11-2	Landis Machine Co.	Bulletin G-95	Describes Landis LL Receding Collapsible Taps.
A-11-20	Lapointe Machine Tool Co.	Bulletin VPD-5	Gives technical and complete information on Lapointe's V-8 Vertical Pull-Down Broaching Machine.
A-11-32	Latrobe Electric Steel Co.		Eighty-six page tool and die steel manual.
A-11-21	Metal Carbides Corp.	Catalog 50-G	Specification, engineering and ordering information contained in Talide Tool Catalog.
A-11-144	Micromatic Hone Corp.		"Cross Hatch" literature describing Michrohoning of Interrupted Surfaces.
A-11-143	Miller Motor Co.	Bulletin A-105	Bulletin emphasizing advantages of company's air cylinders also "J.I.C. Pneumatic Standards for Industrial Equipment".
A-11-111	Moore Special Tool Co.		Twenty-four page No. 2 Jig Borer catalog.
A-11-100-2	Morton Machine Works		Illustrated 72-page catalog shows complete line of fixture clamps and components; includes full size templates.
A-11-135	Norton Co.	Form 2006	Forty page illustrated booklet giving information on every phase of cylindrical and centerless grinding applications.
A-11-166-2	Oakite Products, Inc.		Forty-four page illustrated booklet, "Some Good Things to Know About Metal Cleaning" answers questions on this problem.
A-11-161	Ortman-Miller Co.		Complete set of templates showing all cylinders and mounting brackets.
A-11-118	Plan-O-Mill Corp.		Bulletin about precision metal-working at production speeds.
A-11-115	Potter & Johnston Co.		Booklet, "Productivity with Economy," illustrates examples of precision tooling on P & J Automatics.
A-11-137	A. Schrader's Son		Information on Air Ejection Sets.
A-11-163	Scully-Jones & Co.	Bulletin 10-50	Bulletin showing types, sizes, specifications and prices of S-J Automatic Recessing Tools.
A-11-5	Standard Gage Co.	Catalog B	Describes company's line of Gages.
A-11-110	The Standard Electrical Tool Co.	Bulletin TW	Provides extensive information on company's tool grinders.
A-11-134	Standard Pressed Steel Co.		"Unbrako Standards"—a complete listing of Standard Unbrako Socket Screw Products.
A-11-19	Sundstrand Machine Tool Co.	Bulletins 713	Information on four types of modern Sundstrand Automatic Lathes.
A-11-102-2	The Henry G. Thompson & Son Co.	Form HS-1951	Information on company's line of Hack Saw Blades.
A-11-13	Valley Machinery & Supply Co.		Illustrated catalog on New Tip-Brazing Unit.
A-11-162-3	The Van Keuren Co.	Catalog & Handbook 34.	208 page volume covering 2 years research on thread measuring wires.
A-11-101	Wesson Co.	Bulletin 511	Bulletin on Wesson's new Ban Type Multicut Holders.

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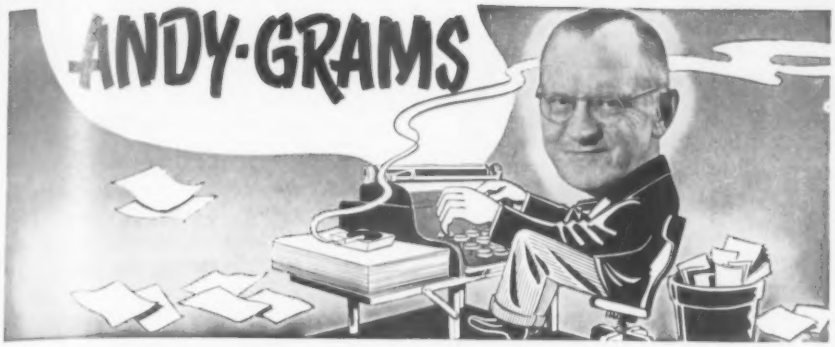


At time of writing, I'm rounding out my sixth week as a "native" Californian, and the least I can say is that I like it. Walnut Creek is a small town, yet said to be one of the fastest growing in the U.S.A., and people are friendly and life is good. Any regrets I may have over the change are due to missing old friends, but then, as Ed Berry put it in a letter, I haven't left anyone behind, I'm "only a couple of hills away".

Speaking of friends, I must have more than my share to judge by the way letters from ASTEers and others come pouring in. I'll just have to ask the senders to have patience until I can get around to answering. Right now, our furniture having come from the East, there's hustle and bustle and I'm hard put to keep my mind on the writing. Can't put it off a/c there's a deadline to meet—my last, as far as this column is concerned.

Anyway, we're tickled pink with our new home, the address of which is 900 Jeffrey Lane (Walnut Creek, Calif.) in case you're out this way and feel like dropping in. You'll be welcome! What with a Norwegian mining engineer on one side, and a Danish builder on the other, I had suggested we name it Valhalla Court. But, it seems there's a cemetery by that name, which is a misnomer a/c Valhalla is a place for wassail and skoaling. Like the poet said of the dying Viking (my translation):

> . . . . Valkyries now bear me to Valhalla's
> halls, where daily may Champions meet,
> in wassail or combat and wounded or slain, shall rise on the morrow to battle again!

Yessirs, California's some state, next to the biggest in the Union, and they do things in a big way having started 'way back with the towering redwoods. And the way things grow in this adobe! F'instance, I was stretched out in the back yard t'other day, sunning myself (that was before we moved in) and what with the drone of humming birds and all I fell asleep. Woke up, a/c feeling chilly, to find myself in the shade of a poplar that I'd planted the night before as a seedling. Let the Texans beat that one!

Now, I want to tell you about Golden Gate chapter, having attend the September meeting in Moose Hall. Had a royal welcome and was seated right up with the brass at the head table. Guest speaker was a Scotchman—at least, his burr was Scotch and so were his jokes—by name Ed Connelly. The guy knows his stuff; has had a whale of a lot of practical experience and theoretical training and gave a real good talk. You'll like him!

Meeting so many men all at once—and take it from me, the Golden Gate boys really attend meetings!—I can't remember all names but will get acquainted as I go along. However, I had the pleasure of renewing acquaintance with ch'man Ben Berlien, Pratt & Whitney's Ted Rohrer, who is now 1st vice-ch'man, and Dave Gustafson, 2nd vice-ch'man, all three of whom I'd met on my previous visit. Also, among chapter officers, met Jack Moeller, secretary, and Dean Roulund, keeper of the wampum and, at dinner, found myself seated next to likeable Tony Severdia, const'n and by-laws, with whom I enjoyed a lively conversation. Al Minetti, who was ch'man during my previous visit, is now *Advisory*. Evidently, Golden Gate chapter takes full advantage of experience.

Had the further pleasure of meeting Karl Bues, past Nat'l Director who is held in very high esteem by his fellow members. I've an idea that we'll see Karl again in the Nat'l picture; for that matter, there's plenty of good timber in Golden Gate chapter. From my own impressions, the chapter is superbly officered and meetings are enthusiastic; in addition, there is a warmth of friendliness which, while prevalent throughout the ASTE, is particularly noticeable in this group. Reminds me strongly of the spirit prevailing in Boston chapter.

I was rather surprised, on receiving the meeting notice, to see that the chapter is sponsoring a course on "The Fundamentals of Tool Engineering" which is the title of a series I wrote for *The*

Tool Engineer some time ago and which, among other writings, I intend to expand into book form once I get into the groove out here. Oh, I've no idea of sinking into oblivion, rather, have some rather ambitious plans for the future.

At this point, I might say that I haven't got around, as yet, to contacting relatives and friends of members regarding whom addresses have been mailed me. As previously stated, California is a big state and it's quite a hike from north to south, but I have all names and addresses noted, and I'll get around to all of 'em in time. So far, I've only been in San Francisco once, the rest of the time having been spent gadding around the small adjacent

Right now, the ASTE is redding up for its Big Show in Chicago, come next spring, and if I were to give California industrialists a bit of advice it would be: Get on the bandwagon and reserve space! Now! I've a hunch that this is going to be an outstanding Exhibit and, what with the way the West Coast is producing tools and machinery, this Show provides a golden opportunity to display wares to buyers North, East, West, South.

In this connection, there's a lot of discussion going on about "foreign competition" in the small tools and machine tool lines—in all lines of manufacture, for that matter. All right, we want to sell our wares abroad, and unless our foreign customers can in turn dispose of their goods for dollars they just won't have any money with which to buy our products. All things considered, then, it looks like good business to apply the golden rule in a practical way. Live and let live.

It's been said that the "saddest words by mouth or pen are these, it might have been". Maybe so, but neither is it particularly pleasant to have to say farewell. But as previously intimated, this concludes the Andygrams—there just won't be no mo'. So, before appending the final "30" to my page, I want to reiterate my faith in the ASTE and in the work to which it is dedicated.

As it continues to grow and prosper, however, I would have it remain as a friendly society; as it was in the beginning, so shall it remain. And now, as the Spaniards say:

Go with God.

30

Andy

Technical Shorts . . .

MAGNESIUM ALLOYS can be formed by a metallic-powder compressing process rather than by the conventional process of melting magnesium together with other metals, according to an Air Force research report. This alloying process consists of mixing atomized magnesium powder with powder of the alloying metals and extruding the powder mixture. In the conventional process magnesium and the alloying metals are melted together, cast to form alloy ingots or billets which are then extruded.

According to the report, the powder-extrusion process results in many alloys having higher strength than alloys of the same composition prepared by extrusion of billets. At the same time, it is said to make possible new alloy compositions not obtainable by the melting and casting process. These compositions are said to provide the advantages of greater strength, improved corrosion resistance and better fabrication characteristics.

A CHEMICAL METHOD for determining the final amount of magnesium retained in cast iron after production has been developed recently by research men of the National Bureau of Standards. The magnesium, which is added to the cast iron because of the desirable ductile qualities it imparts, is lost in variable amounts during production. Spectrographic methods have been used for quick routine examination, but no certain chemical method for checking spectrographic standards, as well as for use in laboratories not equipped for that process, has been available.

In the NBS method, the cast iron sample is dissolved in hydrochloric acid and the iron removed, after oxidation, as the chloride by ether extraction in a continuous extractor. Magnesium, together with part of the manganese, is precipitated as phosphate from an ammoniacal citrate solution. After dissolving this phosphate precipitate in diluted acid, the manganese is removed by precipitation with ammonium persulfate as manganese dioxide. Magnesium is then precipitated as the phosphate, ignited, and weighed as $Mg_2P_2O_7$. Finally, the weighed phyrophosphate precipitate is examined for calcium by the sulfate-ethanol procedure, and any necessary weight correction is made.

TRADE LITERATURE

Free Booklets and Catalogs Currently Offered By Manufacturers

Chucks

Photos and drawings illustrate informative 68-page booklet "Chucks and Their Uses" showing all types of standard and many special chucks; gives details of construction, use, mounting; includes information on care of chucks, lubrication and cleaning, spindle noses, magnetic chucks, vises. **The Skinner Chuck Co.**, 344 Church St., New Britain, Conn. **L-11-1**

Milling Tools

Catalog No. 51-806 pictures line of milling cutters, slitting saws, end and shell-end mills, keyseat and T-slot cutters, giving dimension and price information. Also includes tabulated data on speeds and feeds recommended by milling machine manufacturers, tips on regrinding, use of soluble oils and information on special cutters. **The DoAll Co.**, 254 N. Laurel Ave., Des Plaines, Ill. **L-11-2**

Metal Cutting

"Fundamental Aspects of Metal Cutting and Cutting Fluid Action" gives authoratative treatment of the subject by Hans Ernst, director of research at Cincinnati Milling; well illustrated by photos, graphs and data tables. **The Cincinnati Milling Machine Co.**, Cincinnati 9, Ohio. **L-11-3**

Synchronous Motors

Bulletin 05B7648 describes standard construction features of its low-speed, coupled-type, pedestal-bearing synchronous motors, emphasizing special features, advantages. **Allis-Chalmers Mfg. Co.**, 1004 S. 70th St., Milwaukee, Wis. **L-11-4**

Boring, Turning

Four-page bulletin discusses Niles 42-in. vertical boring and turning mill with side head, pointing out 50 features of its design, construction and operation; includes specification data. **Baldwin-Lima-Hamilton Corp.**, Hamilton, Ohio. **L-11-5**

Materials Handling

Booklet discusses advantages of automatic unloading of power presses with company's equipment; descriptions, illustrations, plus complete instalaltion and operation instructions included. **Sahlin Engineering Co.**, 267 Ferndale St., Birmingham, Mich. **L-11-6**

Speed Reducers

Widely illustrated brochure describes line of worm gear speed reducers showing various applications and stressing advantages and main features. **Cleveland Worm & Gear Co.**, 3249-59 E. Eightieth St., Cleveland 4. **L-11-7**

Presses

Widely-illustrated brochure tells about automatic production "Piece-Maker" press, pointing out its main features and stressing accuracy of alignment as concerning intricate stampings. Lists standard features and optional equipment and also presents specifications and dimensional drawings. **The Minster Machine Co.**, Minster, Ohio. **L-11-8**

Metal Cleaner

Folder describes compound for removing oil and rust while conditioning metal prior to painting; outlines physical characteristics, main advantages and uses. **Oakite Products, Inc.**, 158 Thames St., New York 6. **L-11-9**

Small Gears

Six-page folder illustrates different types of fractional horsepower gearing from company's line emphasizing efficiency and economy; two useful standards charts included in data. **Gear Specialties Inc.**, 2635 W. Medill Ave., Chicago 47. **L-11-10**

Face Grinders

Circular No. 8462-RM pictures line of face grinders pointing out main features and describing operations, capacities; tables give specifications and dimensions. **Mattison Machine Works**, Rockford, Ill. **L-11-11**

Castings

Four-page booklet "25 Years of Proof in Service" provides number of case histories of unusual applications of Meehanite castings in various industries. Data table shows general engineering characteristics as cast (½ in. bar). **Meehanite Metal Corp.**, Engineering Service Dept., Pershing Square Bldg., New Rochelle, N. Y. **L-11-12**

Cutting Tools

Pocket-size handbook on "Maintenance of Alloy and High Speed Cutting Tools" covers lathe and planer tool grinding, cutters and reamers, grading recommendations, coated abrasives and other pertinent items; illustrated by photos and engnieering drawings. **The Carborundum Co.**, Niagara Falls, N.Y. **L-11-13**

Reproduction Paper

"New Short Cuts and Savings" contains case histories illustrating operations in drafting room, reproduction department and shop using Kodagraph Autopositive paper, low-cost photographic intermediate material which gives positive copies directly, stressing low cost, simplicity and other advantages. **Eastman Kodak Co.**, Industrial Photographic Div., Rochester 4, N. Y. **L-11-14**

Motor Valves

Specification Sheet 419-1 describes and illustrates company's series 100 diaphragm motor valve, giving pertinent data on size, construction, body pressure range, mounting dimensions. **Minneapolis-Honeywell Regulator Co.**, Brown Instruments Div., Station 40, Wayne & Windrim Aves., Philadelphia 44. **L-11-15**

Remote Controls

Twelve-page booklet "The Key to Remote Control" gives detailed description of line of push-pull controls for transferring such movements from one location or mechanism to another; dimensions and engineering data included. **American Chain & Cable Co., Inc.**, Automotive & Aircraft Div., 601 Stephenson Bldg., Detroit 2. **L-11-16**

Cutting Tools

Advantages, limitations and fields of applications of Crobalt cast alloy cutting tools are discussed in bulletin 101, outlining working conditions resulting in best performance; describes and illustrates forms and sizes of tools available for turning, facing, milling, boring, reaming; recommended feeds and speeds for wide range of materials, as well as instructions on grinding tool bits and blades, included. **Crobalt, Inc.**, 2800 S. State St., Ann Arbor, Mich. **L-11-17**

Ladders

All-steel mobile ladders, available in models with from one to eight steps described and pictured in catalog showing main features and advantages stressing safety points. **Ballymore Co.**, Wayne, Pa. **L-11-18**

Good Reading

A GUIDE TO SIGNIFICANT BOOKS AND PAMPHLETS OF INTEREST TO TOOL ENGINEERS

ENGINEERING AND WESTERN CIVILIZATION, by James Kip French. Published by McGraw-Hill Book Co., New York, N.Y. 397 pp.; price $5.00.

The author, who is Professor of Civil Engineering and Dean Emeritus of the School of Engineering, Columbia University, has presented an entirely novel approach to history to provide a socio-economic analysis of the concurrent rise of engineering and the western way of life.

As the author points out: " . . . engineering advances have been the primary forces in the creation of our modern, industrial economy in making possible even higher standards of living for constantly increasing populations." For a complete understanding of the development of modern civilization, therefore, it is essential that any study of its progress be supplemented by an engineering interpretation of history.

The book outlines the history of engineering from early beginnings to modern times, with notes and comments on the economic and social conditions and their effect on technological progress. The author avoids technical details and so treats his subject in historical perspective. A really interesting book!

MATHEMATICS FOR ENGINEERS by Raymond and Richard Dull. Published by McGraw-Hill Book Company, New York, N. Y. Third edition, 1050 pp. price $7.50.

Brought up to date and with new material added, this volume is intended to serve as a reference book on the many aspects of mathematics encountered by the engineer in his work. Some graphical solutions to problems are given, as well as many illustrative problems.

The new material in this edition includes a chapter on Dimensional Analysis and Similarity Analysis, which is a useful tool for predicting the functional form of physical relationships. Another new chapter, on Differential Equations, supplies a number of illustrative examples which show how to recognize and solve the types of these equations which occur most frequently in engineering. A fuller treatment has been given to the many practical applications of the Infinite Series in the engineering field, and the section on trigonometric functions has been expanded.

ADAMAS

...now has a complete range of solid carbide inserts *in stock* for you!

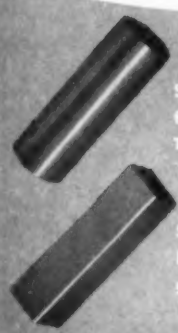
ADAMAS rounds out its line and brings you GOOD NEWS ON FAST DELIVERY for all of your finish ground solid carbide insert blanks and centerless ground solid cylinders, in a complete range of styles and sizes. Your orders will be shipped IMMEDIATELY from our large and adequate stocks, they're available in all of the standard grades for these styles of blanks.

Our new Stokes S-5— a high production press of the largest type in use in the carbide industry —ASSURES YOU of the USUAL PROMPT ADAMAS SERVICE on SC, TB, SQ, and RB style blanks.

Smart carbide users always

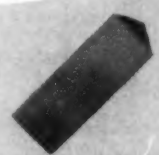
Specify **ADAMAS TUNGSTEN CARBIDE**

for the triple advantages of quality, delivery and price



Style SC Solid Round Inserts for Boring Tools, Insert Type Tools, and wear parts

Style RB Rectangular for Insert Type Tools all finish ground.



Style TB Triangulars for Insert Type Tools

Style SQ Squares for Insert Type Tools

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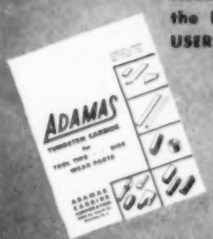

ADAMAS CARBIDE CORPORATION

1000 SOUTH 4th ST., HARRISON, N. J.

PRODUCERS OF TUNGSTEN CARBIDE TOOL TIPS, DIES AND WEAR PARTS

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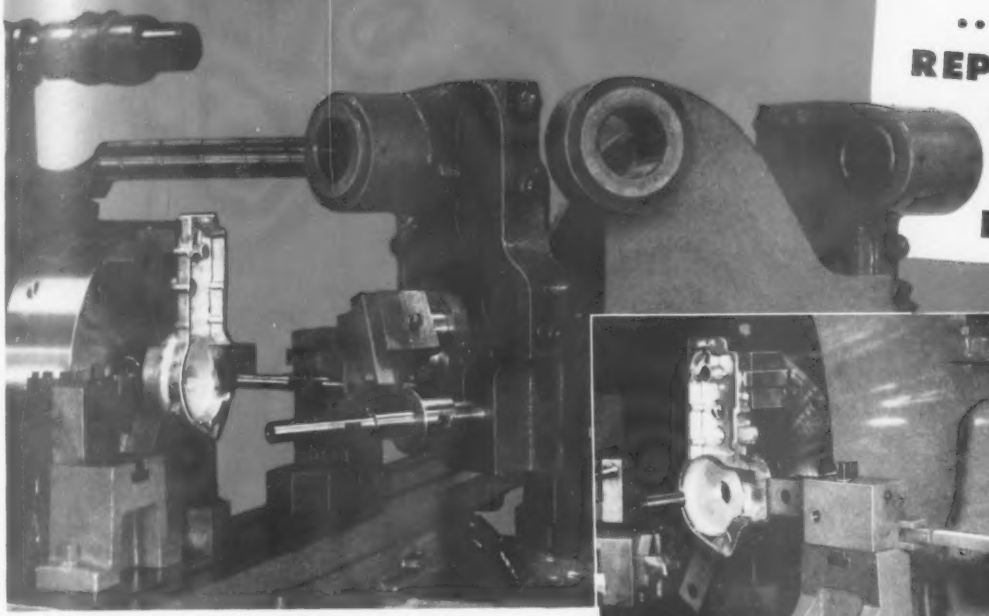
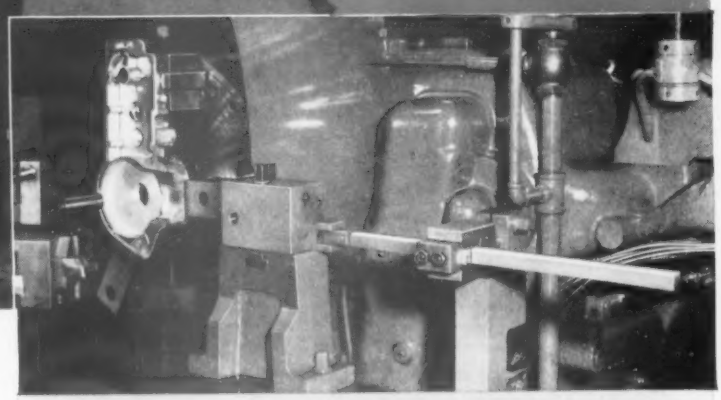
P&J AUTOMATICS

...ON NEW PRODUCTION

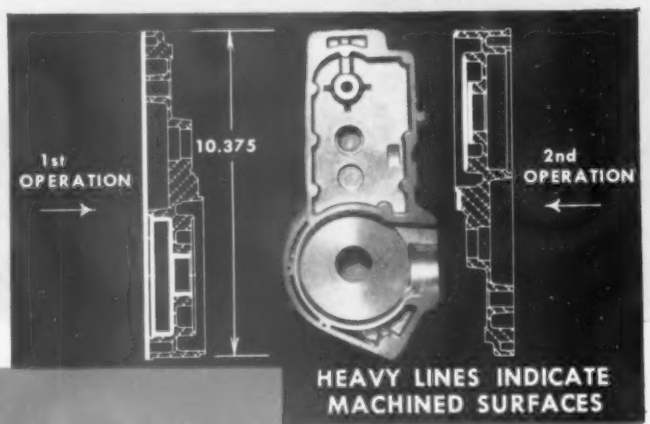
...OR AS REPLACEMENTS FOR TIRED, SLOW EQUIPMENT





This P&J engineered Facing Tool on the cross slide machines the front surface of these castings. It is self-relieving, thereby eliminating objectionable tool return marks on the face of the work.

HERE'S an example: a single P&J 5DE AUTOMATIC, equipped with standard and special Tooling designed by P&J experienced specialists, turns out these intricate housings of cast aluminum — taking 21 cuts in all for both first and second operations (see drawings at right). If you have need for *quantity production* of similar quality work, get a time estimate from P&J; no obligation.



HEAVY LINES INDICATE MACHINED SURFACES

POTTER & JOHNSTON Co.

Subsidiary of PRATT & WHITNEY
Division NILES-BEMENT-POND COMPANY
PAWTUCKET, RHODE ISLAND, U.S.A.

Precision Production Tooling for 53 years

Numerous similar examples of productivity with P&J Tooling on P&J AUTOMATICS are shown in this free booklet. Write for your copy.

THE BIG "3"

Capable of rough cutting plus blending of welds.

Only really flexible grinding wheel ever offered.

Withstands extremely rough usage —extra safe.

BAYFLEX • DURACUT • SAF-T-CUT, reinforced abrasive disc-wheels . . . the masters of your weld grinding and finishing problems. Greater resiliency and safety make these "Big Three" products first choice in foundries, metal fabricating and welding shops.

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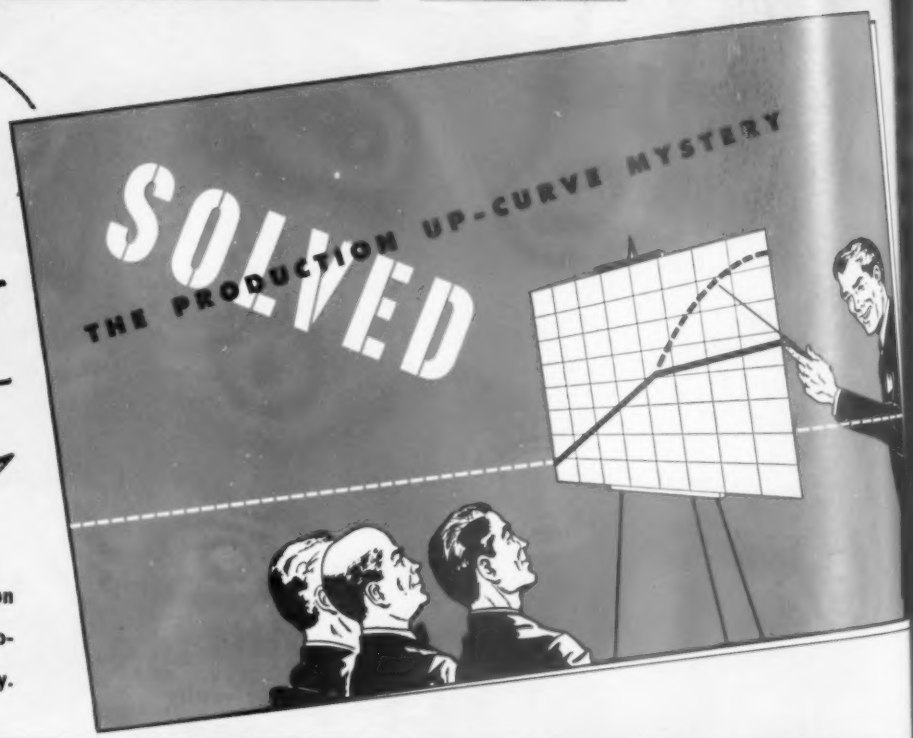
GRINDING WHEEL INSTITUTE MEMBER

Send for latest information-packed "BIG-THREE" catalog. It contains such data as mounting instructions, recommended speeds, charts, specific applications, etc.

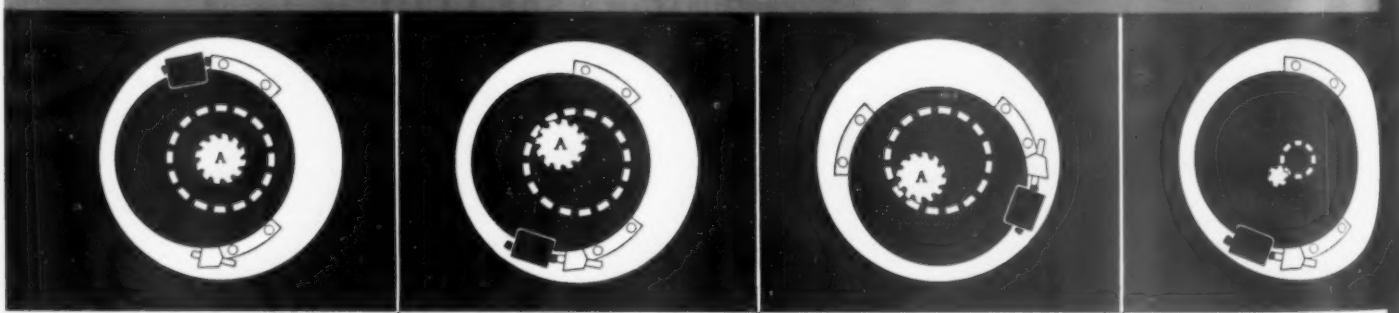
Are You Doing PRECISION WOR(at PRODUCTION SPEED?

Then You Will Perhaps PROFIT From Reading —



It contains very interesting information about precision metal-working at production speeds. Send for your copy today.

PLANETARY FORM AND THREAD MILLING— INTERNAL AND EXTERNAL—BY PLAN-O-MILL



The work (dotted white circle) does not revolve. Cutter is revolved around work.

For internal form and thread-milling, cutter (A) moves out from center to contact work.

Cutter moves in circle, completing cut; rapid reverse returns cutter to center.

For external milling, cut moves in to contact wor then moves around wor

PLAN-O-MILL

REQUEST FORM

PLAN-O-MILL CORPORATION
1515 E. Eight Mile Road
Hazel Park, Michigan

Please rush my copy of: "SOLVED: The Production Up-Curve Mystery."

Title_____

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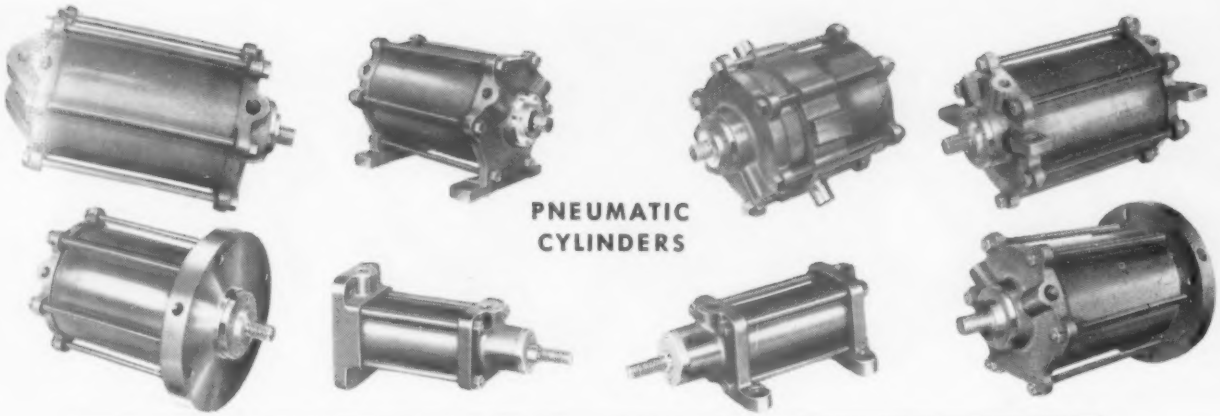

PNEUMATIC CYLINDERS

Q: Joe, do you think you can buy a cylinder to do this job? It looks plenty special to me!

A: Absolutely, Boss! Hannifin has more than 65 different mounting combinations in hydraulic cylinders, alone. And, if it has to be a special cylinder, Hannifin can build that, too.

Hannifin is *the* authoritative source for the broadest range of hydraulic and pneumatic cylinders—backed by an experienced corps of engineers, sold by a large force of factory-trained field engineers. Illustrated here are only a few of the many standard Hannifin hydraulic and air cylinders. Hannifin Corporation, 1119 South Kilbourn Avenue, Chicago 24, Illinois.

Complete hydraulic cylinder catalog, illustrating design features, styles, dimensions. Also bore tables, engineering data and formulae.

Complete illustrated pneumatic cylinder catalog giving design and construction features, bore tables, mounting styles and other information.

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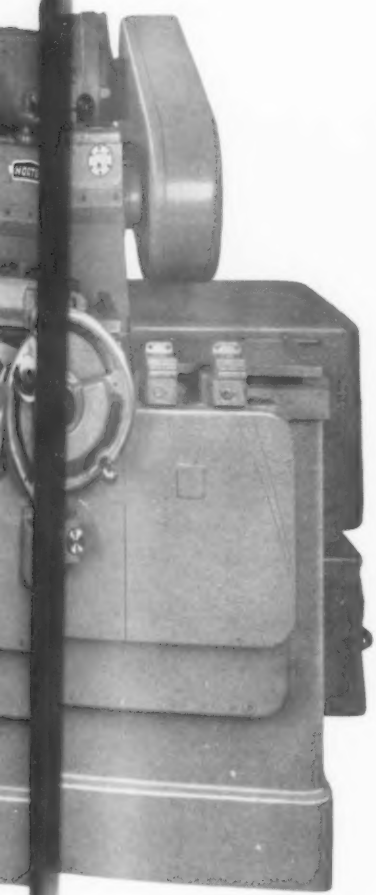
YOU CAN BE *SURE*, IF YOU—do *ALL* you CAN do . . . with

HANNIFIN

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Hydraulic Riveters • Air Control Valves

Production *DOUBLED* with NORTON 6" Type CTU Semiautomatic Grinders



PROBLEM

The Jacobs Manufacturing Company, Hartford, Conn., prominent manufacturers of chucks, desired increased output in the grinding of certain of their chuck bodies. Two diameters on each body were being ground in separate operations — at a production rate per hour of 150 of a small body and 130 of a larger.

RECOMMENDATION

Norton Engineers suggested new 6″ Type CTU Semiautomatic Grinders each equipped with a Live Spindle Workhead and a two-wheel mount — to grind both diameters simultaneously.

RESULT

Jacobs Manufacturing Company now finishes more than TWICE as many pieces per hour with each Norton 6″ Type CTU Semiautomatic Grinder. Furthermore, all pieces are finished with better concentricity, thereby rejections are reduced. Still another case history of how you can economize by modernizing with new Norton Machines.

To Economize Modernize with NEW

NORTON

GRINDERS and LAPPERS

END MILLS

are experts at Curling, too!

If you want to put the canny Scotch touch on your end-milling costs . . . *then specify Morse Hi-Helix!*

For this is the only design of end-mill that gives you real Morse shear-cutting performance . . . *making the chips CURL and roll out without clogging the flutes.* Cutting action is fast and smooth. Tool-life is far longer. And for even greater tool life, specify Morse Electrolized.

What's more, Morse *Hi-Helix* End Mills are properly undercut and ground with a primary and secondary clearance. And because Morse puts more into their manufacture, you get more out of Morse End Mills in production . . . which makes it just as simple as this: *If you want Morse Quality, then be sure you get genuine Morse Tools.* Ask your Morse-Franchised Distributor . . . he has the stock and the experience to make sure you get exactly what you need.

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASS.
(Div. of VAN NORMAN CO.)
Warehouses in New York, Chicago, Dallas, Detroit, San Francisco

MORSE
Cutting Tools

For those tough *Special* jobs . . . depend on

NATIONAL TOOL CO.

and our field representatives from coast to coast

Since 1905 **engineers and manufacturers of high-quality special cutting tools for the metal-working industry**

● **National Tool Co. engineers are backed by years of successful experience in special tooling and related problems. Their assistance is yours for the asking—whether you're interested in one tool or the tooling program for a whole plant.**

A PARTIAL LIST OF *Special* TOOLS ENGINEERED AND MANUFACTURED BY

Gear Shaper Cutters	Milling Cutters	Chamfering Cutters
Herringbone Gear Cutters	Broaches	Rotary Gear Cutters
Ground and Unground Gear and Spline Hobs	Tungsten Carbide Tools	Circular Form Tools
Master Gears	Sprocket Cutters	Gang Cutters
	Profile Form Mills	Flat Form Tools

NATIONAL TOOL CO.
Cleveland 2, Ohio

Representatives in major industrial centers

TO OBTAIN FURTHER INFORMATION ABOUT ADVERTISERS, TRADE LITERATURE OR TOOLS OF TODAY APPEARING IN THIS ISSUE OF THE TOOL ENGINEER, USE THE HANDY READERS SERVICE CARD ON PAGE 105.

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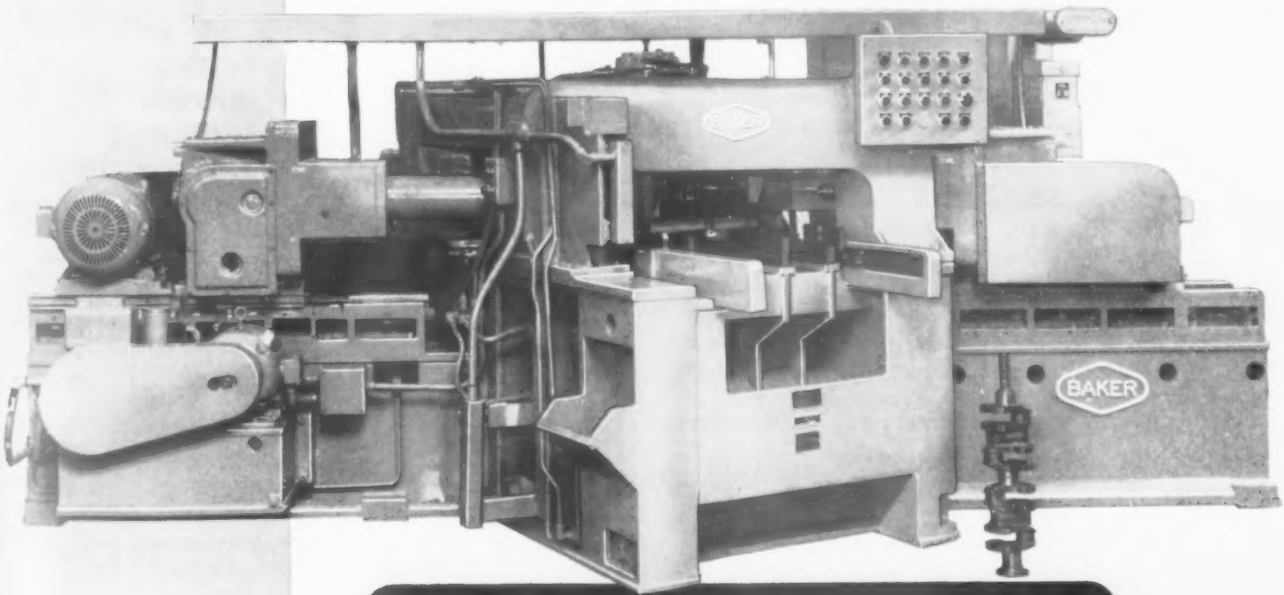
YOU'LL GET *Speed and Precision* with BAKER SPECIAL MACHINES

Precision productivity is the "watchword" with industry today, which makes BAKER special machines a necessity to keeping up production schedules and reducing part costs per man hour. The machine illustrated is a Baker four-station automatic transfer type machine for drilling 1″ diameter lightning holes through crank pin bearings. Utilizing two standard Baker 7½ x 16 horizontal hydraulic feed saddle type drilling units, the Baker is capable of a production rate of 43.8 pieces per hour at 100% efficiency. Outside hydraulic pump sump units furnish hydraulic power for the two 7½ x 16 drilling units. The machine is a four-station, automatic transfer machine. Whatever your drilling problem, consult Baker engineers regarding a Baker special machine that will give you increased productivity at lower cost per man hour.



BAKER BROTHERS, INC., Toledo, Ohio

DRILLING . . . TAPPING . . . KEYSEATING and CONTOUR GRINDING MACHINES

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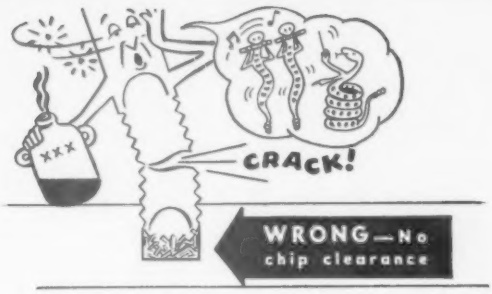
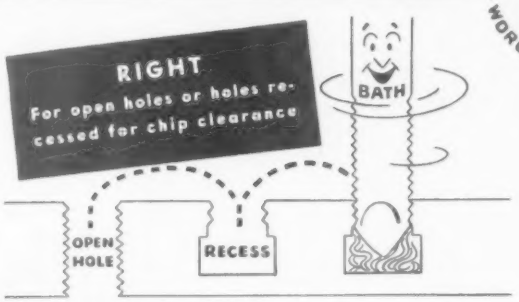
No Postage Needed

Two spiral pointed taps — with flutes clear and true,
Had a different reaction to "pale mountain dew".

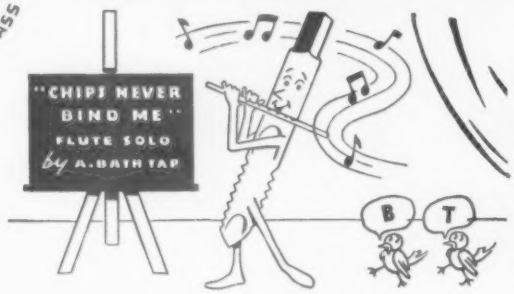


One tapped holes blindly — got "tight" by degrees,
And jammed his O.D. with the "low-down" D.T.'s.
(Damaged Threads)

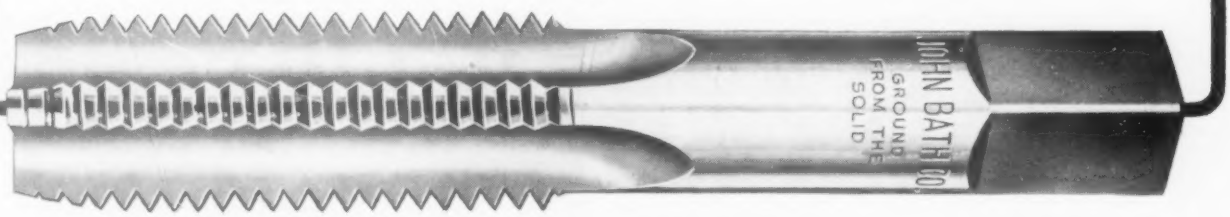
JOHN BATH CO. INC · WORCESTER · MASS ·



The other, straight-fluted; would never touch "likker",
He deflected the chips to thread the steel quicker.



Moral:
To tap blind holes . . . you must have clear heads.
Bath Taps give B.T.'s . . . which means . . . Better Threads.



INSIST ON BATH TAPS . . . PROFIT BY THEIR PLUS-PERFORMANCE

The spiral-pointed, straight-fluted tap is the most efficient member of the machine tap family . . . when properly used. The angle ground into the flutes at the chamfer, deflects the chips, making this type of tap especially effective for threading open holes in steel or nickel. However, the spiral-pointed tap should *never* be used to tap blind holes without sufficient chip clearance at the bottom.

Proper tap selection and use is very important. It means economy in your toolroom. We will be glad to give you the benefit of our experience . . . to recommend the proper Bath ground thread taps for your particular jobs.

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED

28 Grafton St., Worcester, Mass.

H&G DIE HEADS

WITH INSERT CHASERS

FOR ALL MACHINES USED FOR CUTTING SCREW THREADS

The famous H & G Die Heads come in styles and sizes for all types of machines, including threading machines, chucking machines, drill presses, turret lathes, and automatic screw machines, such as Brown & Sharpe, Cleveland, Cone, Davenport, Economy, Foote-Burt, Greenlee, Gridley, Acme-Gridley, New Britain, New Britain-Gridley, Swiss, etc.

The small, inexpensive high-speed steel insert chasers are held by rugged carriers and cut threads straight and true to the close tolerances required.

The majority of expert production men prefer these die heads because of the ease with which insert chasers are resharpened and set, the low cost of insert chasers and the greater quantity of threads per grind and number of pieces threaded per chaser dollar.

The reduction in inventory will pay for new die heads. **For example:** If you have $1,000 in chaser inventory, changing to H&G will require only $300, setting free $700 for the purchase of new H&G heads. This is due not only to low cost of chasers, but to interchangeability and long life.

Check and Mail for Free Copy

- ☐ "Selecting Proper Die Head for the Job"
- ☐ Style MM
- ☐ Style DMS
- ☐ Style DM
- ☐ Style TM

THE EASTERN MACHINE SCREW CORPORATION

27-47 BARCLAY STREET NEW HAVEN, CONN.

Mfrs. General Purpose Die Heads, Insert Chaser Die Heads, Threading Machines.

USE READER SERVICE CARD; INDICATE A-11-130-1

Severance CHATTERLESS TOOLS

HIGH SPEED CARBIDE

Winning their way on job after job, they are carefully designed to preclude chatter and can be depended on to produce superior finishes.

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Severance CHATTERLESS COUNTERSINKS

STANDARD TYPE — Stocked in 13 diameters up to 2" and in 30°, 41°, 45°, and 60° angles (with C/L).

Sizes 1" and larger stocked also threaded for shanks — tapered or straight — in various sizes.

Use CARBIDE for tough jobs or high production.

HEAVY DUTY TYPE — Features larger shanks having a tang drive. Full range of sizes and angles.

HEADQUARTERS FOR COUNTERSINKS, REAMERS, SEATING TOOLS, and SPOTFACERS that preclude chatter.

Severance CHATTERLESS BALL SEAT REAMERS

Standard and Heavy Duty Types 8 sizes each. Made also for shaped cavities — as ordered.

BALL NOSE DRILLS — In corresponding sizes hog out the stock for Ball Seat Reamers.

Severance TAPER REAMERS

- Faster cutting
- Better finishing
- Shear-cut teeth

Tapers up to 15° quickly supplied from stock — up to 1½" diameter x 2¾" long.

Unexcelled for holes having keyways, ports, splines, cross holes, etc.

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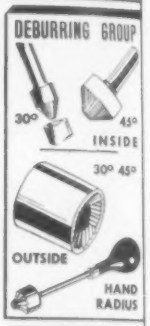

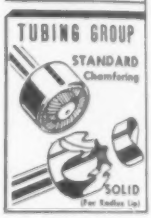

SEVERANCE TOOL INDUSTRIES, INC.

728 Iowa Ave. Saginaw, Michigan

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Simplify LARGE HOLE Tapping

with the New Procunier

TAP KING

Rugged, dependable, with a super-tap capacity of ⅜" to 1" in steel and up to 1¼" in softer materials, the Tap King has been establishing production records. Users claim spectacular daily production gains of 50% and more! Production men report amazing savings in parts spoilage and consistent, more accurate maintenance of uniform tap depth—even on large blind hole tapping jobs! Check these unique features: **Exclusive** 17 tooth spline drive from clutch to tap holder spindle, gives smooth, powerful drive, increases tapping accuracy and reduces strain, wear and vibration; new, sensitive yet powerful friction clutch drives tap smoothly, with finger tip control—drastically reducing operator fatigue resulting in more work in less time with less effort; ball and needle bearings assure longer, trouble-free life; reverse speed is twice forward speed; simplified oiling system; aluminum housing; PLUS many other unusual features.

Write TODAY for circular giving full details and specifications showing how you can adopt this tapping machine to fit your particular needs.

NEW! LARGER "TRU-GRIP" Tap Holder

Makes tapping easier close to walls or shoulders, eliminates "chewed" tap shanks.

Gentlemen:
Please send me full details on the new Procunier "TAP KING" Heavy Duty Tapping Attachment.
Name
Address
City Zone
State

Procunier
Safety Chuck Company
16 S. CLINTON ST. CHICAGO 6, ILL.

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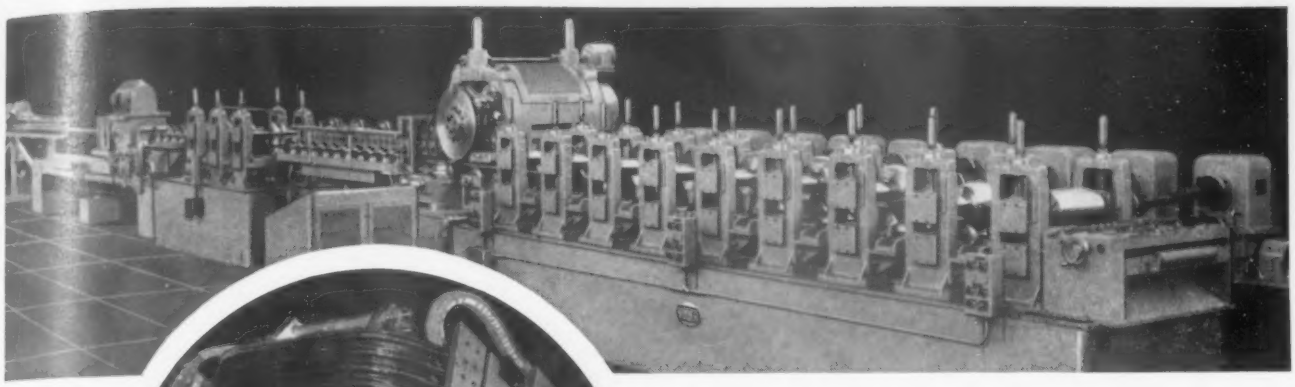

IMPORTANT ADVANCE IN *Tube Welding*

Up to 20% Higher Production

Yoder now announces the greatest forward step in tube welding since the introduction of the first patented Yoder Tube Welder in 1939. The enviable production records established by this welder largely account for the fact that Yoder has furnished more than half of all the resistance-weld tube mills since installed in the U.S.A.

The heart of the new welder is a transformer of revolutionary design. It consists of four smaller transformers surrounding a common core and making an assembly of unprecedented compactness and strength. Reduced impedance accounts for its higher electrical efficiency. It insures longer service life, fewer interruptions for servicing, repairs and maintenance.

Compared with the previous Yoder welder, the production gains may be as high as 20%; compared with other tube welders, the gain may be as high as 50 to 60%. These gains go far toward compensating for increased labor and material costs.

The welder is furnished with all new Yoder tube mills, and is also available for replacing welders in other makes of resistance-weld mills, to step up production and reduce conversion cost.

Descriptive literature, consultations and estimates for the asking.

THE YODER COMPANY • 5525 Walworth Avenue • Cleveland 2, Ohio

Complete Production Lines

- ★ COLD-ROLL-FORMING and auxiliary machinery
- ★ GANG SLITTING LINES for Coils and Sheets
- ★ PIPE and TUBE MILLS—cold forming and welding

ENGINEERING YODER MANUFACTURING

FORESIGHTED

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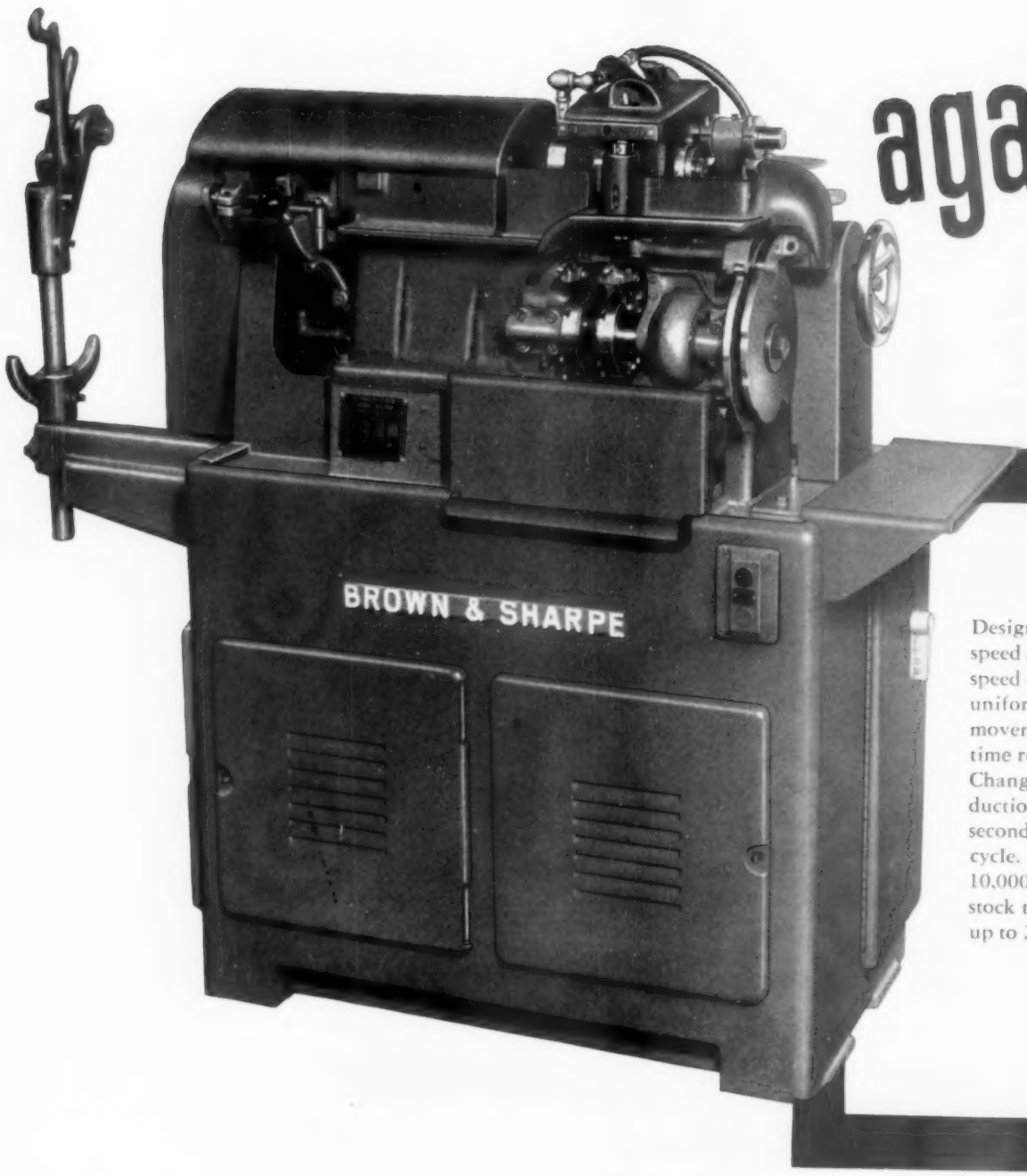
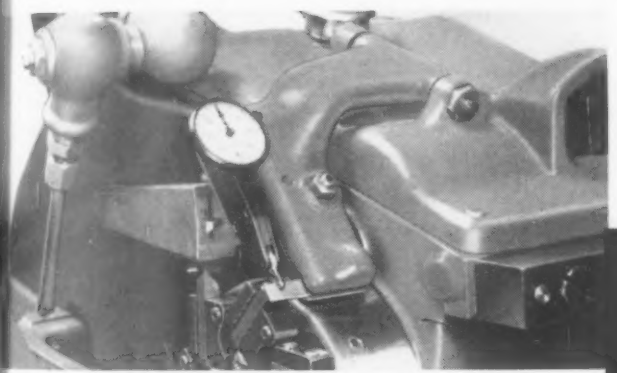


Designed throughout for speed and accuracy. Constant speed drive shaft insures uniformly rapid automatic movements, regardless of time required to make part. Change gears provide production rates from 3 to 364 seconds for one piece per cycle. 16 spindle speeds from 10,000 to 910 r.p.m. Takes stock to ¼" dia. and turns up to 2⅞" length.

PROTECTION

Skilled-Operator Shortage...

Brown & Sharpe
Automatic Pinion Turning Machine



Tool Adjusting Dial Indicator on swing-arm affords quick, accurate replacement of tool . . . saves time and cut-and-try spoilage.

Circular-Formed, Single-Point Tools are dressed by full-length surface grinding across the top . . . can be quickly and accurately resharpened.

Individual Micrometer Stops for each tool simplify accurate duplication of parts without machining cams to extremely close accuracy.

equips you for high output, accurate duplication . . . without expert pinion turning specialists!

With defense orders now adding to normal demands for staff and pinion work, the Brown & Sharpe Automatic Pinion Turning Machine represents one of the soundest investments many manufacturers can make.

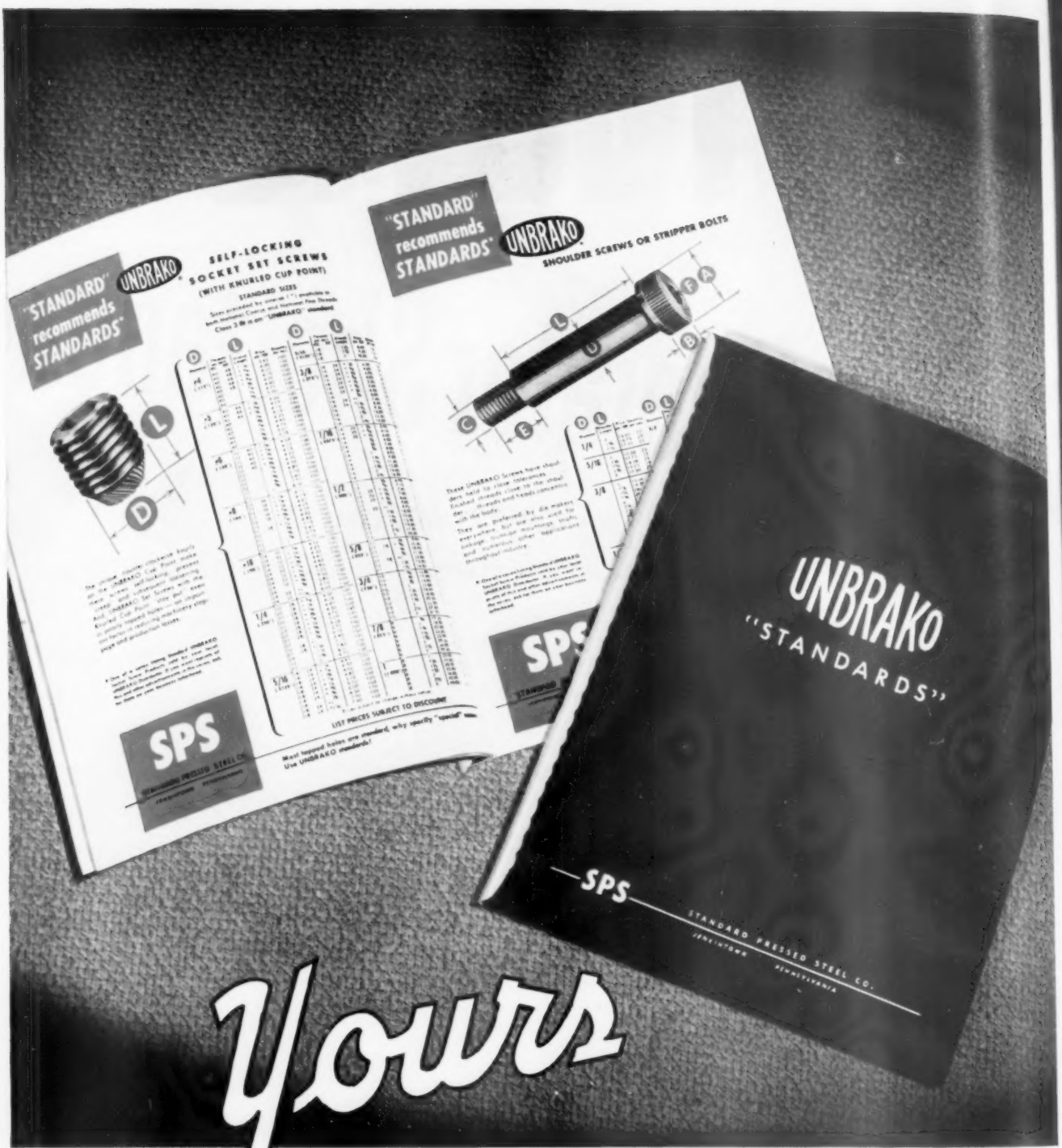
This modern automatic single-point turning machine dependably meets all close-tolerances and fine-finish requirements of military and civilian assemblies such as clocks, instruments, fuses and timers. What's more, accurate operation with exceptionally high uniformity can be maintained without highly skilled operators!

Improved design features that make the Brown & Sharpe Automatic Pinion Turning Machine practically "foolproof" include: exclusive circular-formed single-point tools; built-in tool resetting indicator and tool centering gage; individual micrometer stops for all 8 tool positions; control of all operations by two simple disk cams.

Write for detailed specifications.
Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

B·S

Brown & Sharpe



Yours FOR THE ASKING!

We'd like you to have a copy of Standard's UNBRAKO "Standards"—a complete listing of Standard UNBRAKO Socket Screw Products. Write, today, on your business letterhead.

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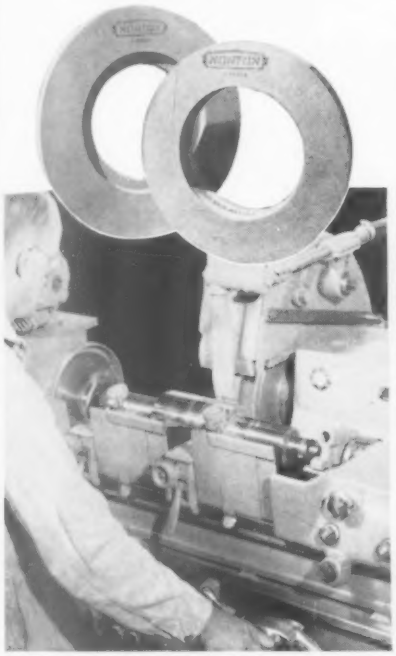
Protect YOUR O.D. GRINDING INVESTMENT with Norton Wheels



Roll-grinding to a super-fine finish

Roughing drill rod in through-feed centerless grinding

No chain can be stronger than any of its links — and no grinding machine can be more efficient than its grinding wheels.

That's why your choice of wheels for O.D. grinding — cylindrical or centerless — calls for every bit as much care as your choice of machines. Because without the *right* wheels the costliest equipment is just so much inefficient machinery. And remember:

No matter what your O.D. grinding jobs are, Norton makes wheels that are exactly right for them. And your Norton Distributor is ready to tell you exactly which wheels you need.

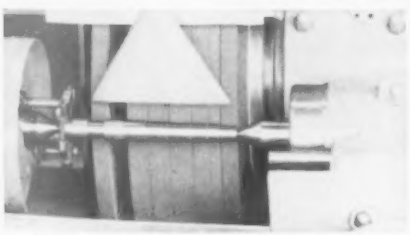
Norton Safeguards for Lower-Cost Grinding

Norton Abrasives, ALUNDUM* (fused alumina) and CRYSTOLON* (silicon carbide) are made in a variety of types and grain sizes for best results on every material handled in centerless or cylindrical grinding.

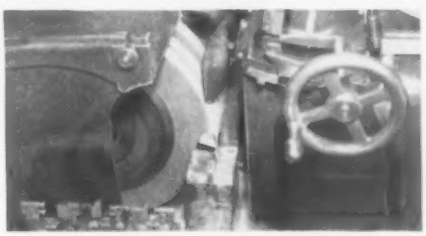
Norton Bonds, vitrified, resinoid, shellac and rubber are available for cool, free cutting action, extra long wheel life and just the finish you want.

Norton Service includes the most comprehensive applicational aid in the field. And if your problems are unusual, your distributor can call on a Norton Abrasive Engineer to give you double assurance of the right wheel for every job.

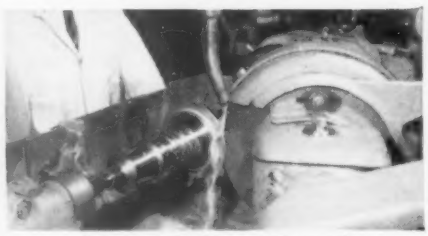
These O. D. Grinding Machines Are Paying Off...WITH NORTON WHEELS



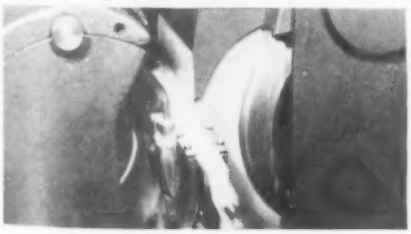
Wheels *must* be uniform in this cylindrical setup for grinding seven diameters at once



Multiple diameter centerless grinding also requires high standards of wheel uniformity



Cylindrical shoulder grinding, with 45° angular wheel head



Through-feed centerless grinding gives high production

GET THE FACTS YOU NEED TO KNOW

This 40-page illustrated booklet is packed with up-to-the-minute information on every phase of cylindrical and centerless grinding applications, including handy selection charts for your general guidance. Ask your Norton Distributor for *The A.B.C. of O.D. Grinding*, or write direct for Form 2006. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

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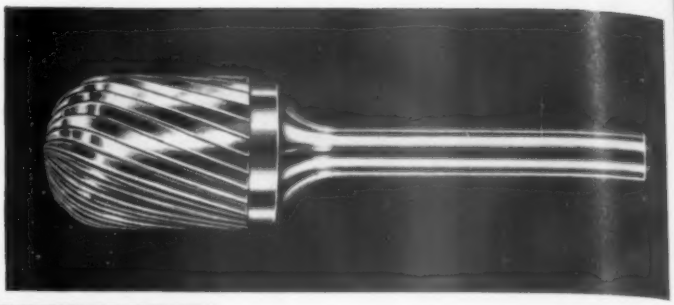
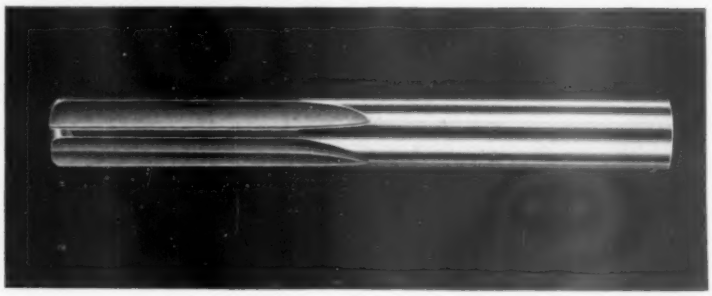
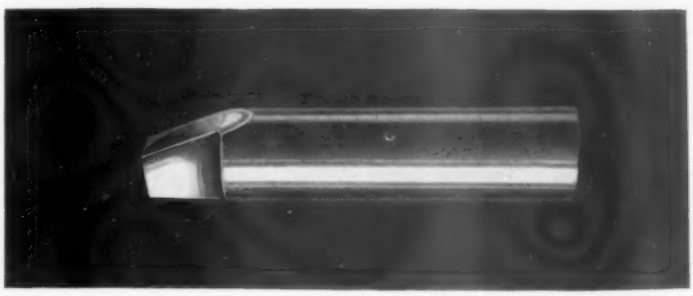


TUNGSTEN CARBIDE



PRECISION GROUND-FROM-THE-SOLID



Special precision machines bring you ground-from-the-solid TUNGSTEN CARBIDE Rotary Files, End Mills, Reamers, Drills, Boring Bits and many others.

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NEWINGTON IN CONNECTICUT

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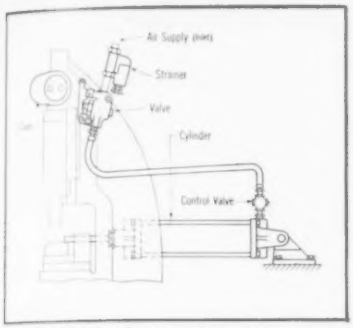
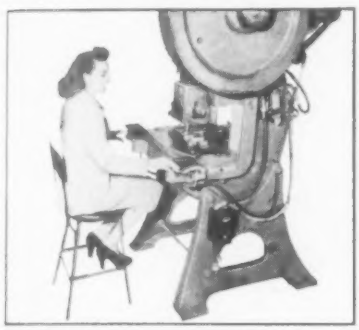
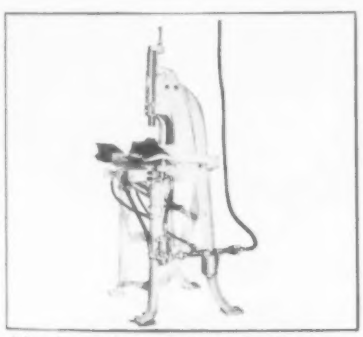


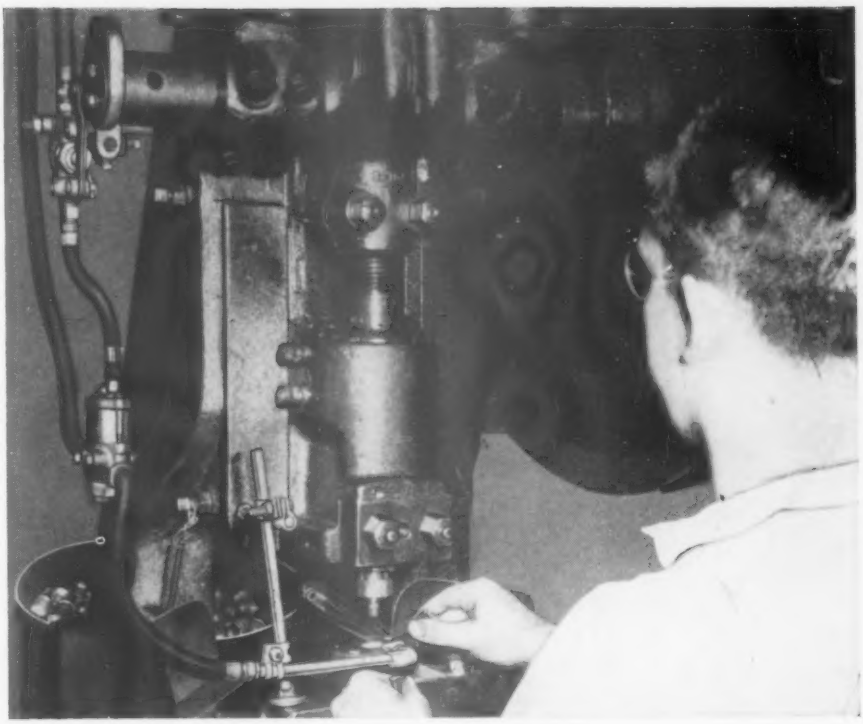
Schrader Cylinder Knockout Sets—are designed for ejecting work which cannot be blown from dies by an air blast. The cam can be adjusted to actuate the knockout cylinder at any point during the press cycle.



Schrader Power Press Controls—are one of the easiest ways to keep hands out of danger zones. Requires the use of two hands to operate the levers. Builds an operator-confidence that increases the flow of production.



Schrader Kick Press Controls—These controls substitute more efficient air power for foot power—thus eliminating fatigue, spoiled work. There is a Schrader control for hand operation, foot operation or both.



How Air Ejection of work can STEP UP Production and Safety

Hand removal of work is slow and dangerous. You can increase production as well as safety—right now--by installing Schrader Air Ejection Sets on your power press or on any other machine that has a moving member to actuate a cam or sliding tripper.

These Air Ejection Sets remove work from the die by an intermittent blast of air. Can be timed to deliver a blast from a fraction of a second to any desired length during or after the cycle. This method saves time and eliminates the hazards of hand removal.

Uses up to 90% less air. Schrader Air Ejection Sets cut down the wasteful flow of a steady air. In many cases air savings up to 90% have been effected by the adoption of Schrader Air Ejection Sets. Before you decide your compressors have reached their maximum capacity investigate how Schrader Controls cut down air waste.

Schrader Air Ejection Sets come assembled and ready to install. They are surprisingly inexpensive and pay for themselves in a matter of weeks.

If you have an ejection problem on any kind of machine, it can be solved easily by one of a number of combinations of cylinders and valves. So look over the machines in your shop. You'll see many places where these ejection sets are just the thing. Ask us to help you determine what will best fit your needs. Send us a letter outlining your particular installation, your idea, or fill out the coupon below.

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EXPOSITION COMMITTEE
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The Complete Tap Story

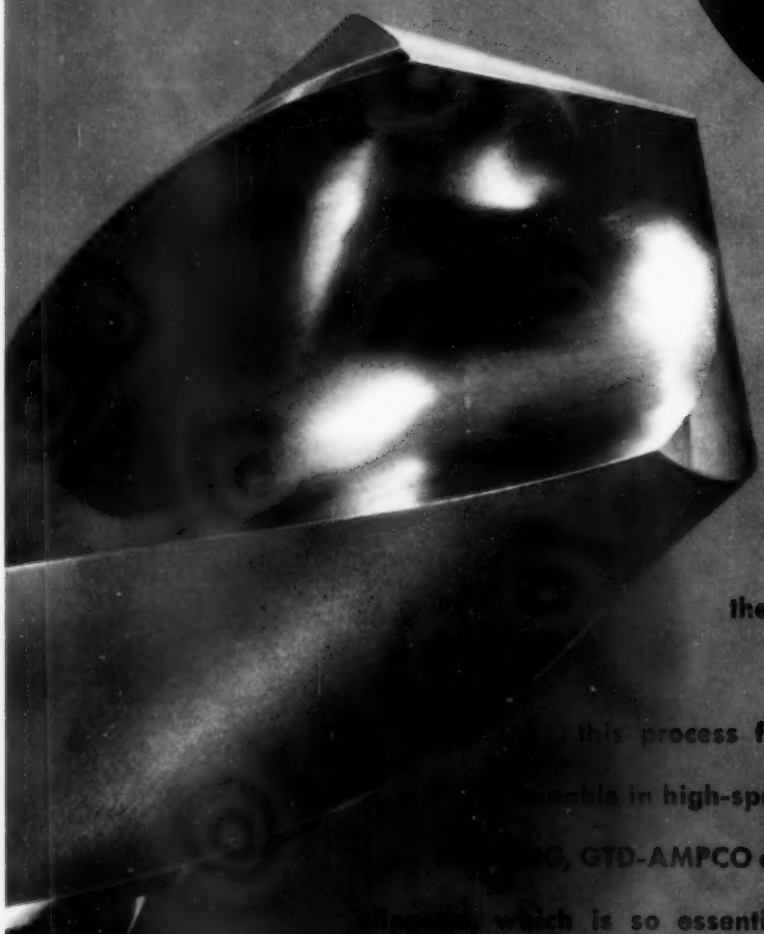
Yes, here at a glance is all you will normally need to know about taps: The types available, how to select the right one for your job, how to order it, and how to use it.

And, as though that were not enough, backing the complete story is your "Greenfield Man," a member of the largest staff of field service engineers devoted to threading problems exclusively.

GREENFIELD TAP AND DIE CORPORATION
Greenfield, Massachusetts

BUY GTD GREENFIELD!

Hammer Forged



Steel makers appreciate the importance of hammer-forging in the refinement of steel and that's why it's universally used from ingot to billet in the making of the higher grades of tool steel.

Hammer-forged GTD-AMPCO drills carry this process further to the highest possible refinement obtainable in high-speed steel. And, as a fitting climax to HAMMER-FORGING, GTD-AMPCO drills are polished in the flutes, insuring free chip elimination which is so essential in drilling deep holes, cast iron and non-ferrous metals. For the best, insist on GTD-AMPCO hammer-forged drills.

AMPCO TWIST DRILL DIVISION

GREENFIELD TAP AND DIE CORPORATION

Greenfield, Massachusetts

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

w the Right Steel Solved hese 3 Tool Problems

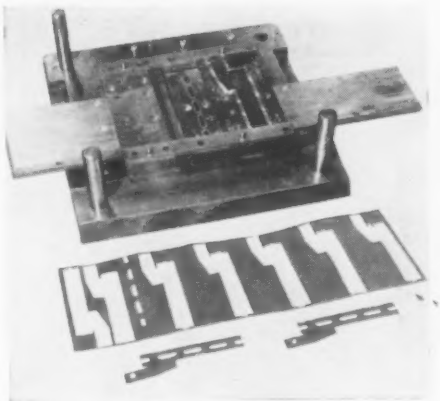
metallurgical servicemen and distrib- rs are constantly on the job to help rs get the most out of their tool steel. re are the highlights of some recent problems solved by selecting a more able steel.

A MAKER OF AUTOMOBILE BUMPERS had been getting poor service from shear blades for trimming hot-rolled spring steel. High-speed steel didn't r long enough and the cutting edge ned. High-carbon, high-chromium steel (our Lehigh H) was tried next. nd plenty of wear-resistance, but the ing edges developed chipping trouble. **LUTION:** Our man suggested Lehigh L high-chromium grade with lower car-). This worked fine — because it had cient wear-resistance combined with e toughness.

AN AIRCRAFT FIRM WAS BOTHERED by the cracking of some special wrenches for assembling aircraft parts. The wrenches had y sharp corners, and both thin and k sections. The application called for nty of toughness and a fair amount wear-resistance. The firm had been king these wrenches from a low-carbon e of silico-manganese tool steel, and y were cracking in the water-quench- operation. **SOLUTION:** We recom- nded Omega. With its less drastic oil- nch and inherent toughness, it has ed the cracking trouble.

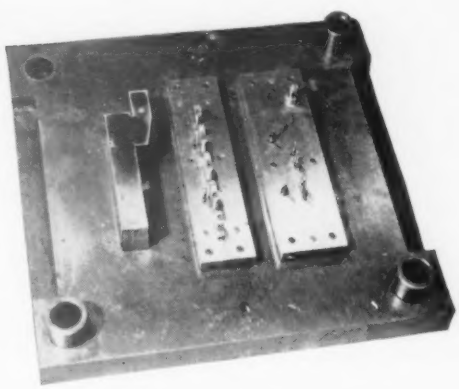
A SHEET-METAL FABRICA- TOR COMPLAINED to a Bethlehem salesman about the premature breakage of small-diameter punches. Rather long and slender, the punches were used on et steel of greater thickness than the ch diameter. (It's usually best for the ch diameter to be greater than the kness of material being punched.) punches were subjected to excessive thrust; constant breakage was run- g up production costs. **SOLUTION:** y tried 07 Chisel, our chrome-tungsten de of shock-resisting tool steel. Result: nches produced about eight times as y blanks as previously.

Die turns out 500,000 pieces . . . and still going strong



This progressive die, made of BTR, performs a perforating, notching, and blanking operation in the production of condenser brackets. This popular grade of oil-hardening steel was selected by the user because it's easy to heat-treat . . . it has good resistance to distortion in heat-treatment and it's easy to machine.

The long-wearing qualities of BTR are evidenced by the production of more than a half-million pieces at the time the photograph was made. Hardened to Rockwell C-59, it produces about 30,000 parts from 3/32-in. steel strip before redressing is needed.



Our Tool Steel Engineer Says:

Rapid wear is caused usually by improper heat-treatment

When tools fail by wearing too rapidly, the trouble can usually be traced to inadequate heat-treatment resulting in decarburized surfaces, improper quenching that produces low hardness, and other faulty procedures.

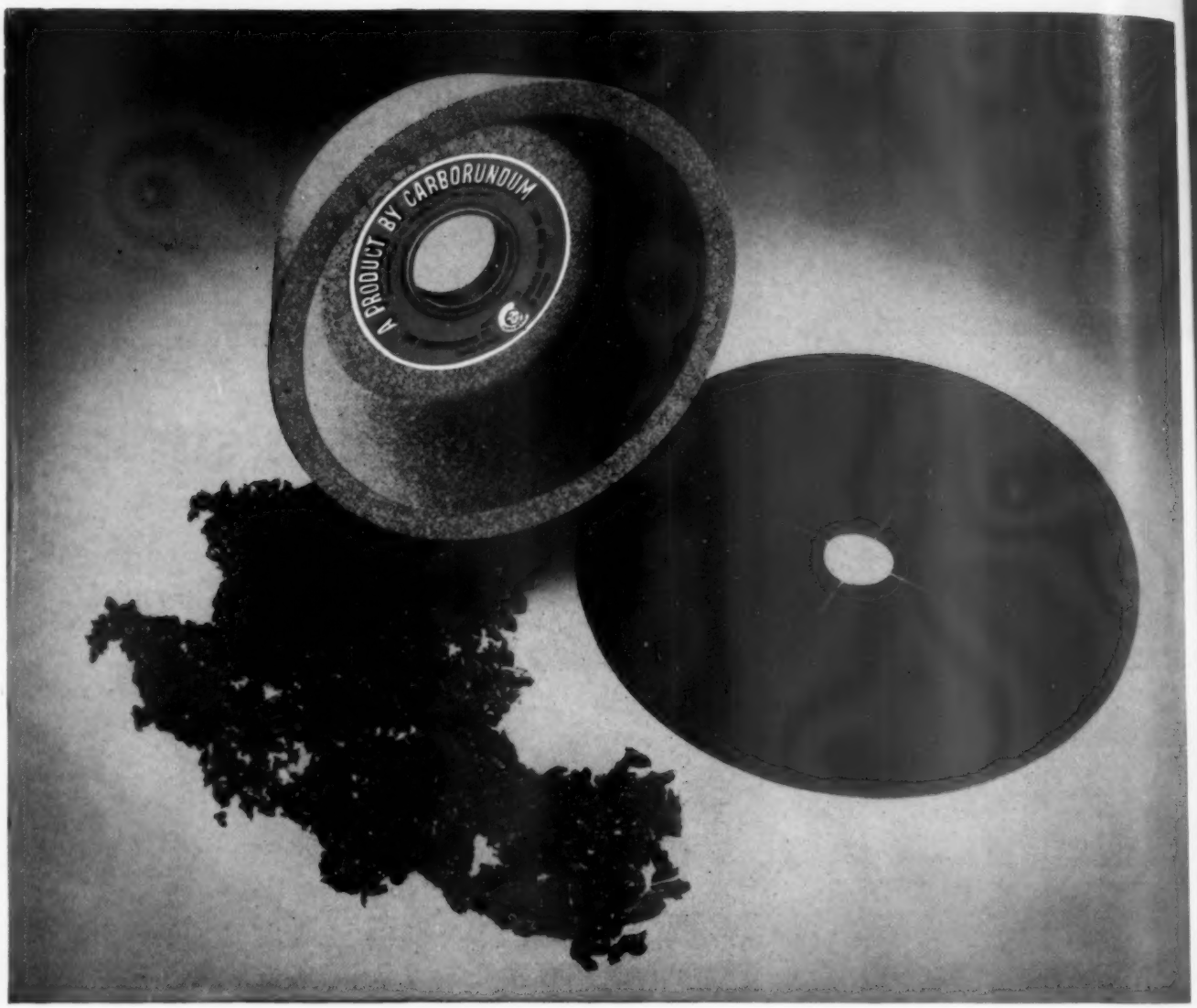
However, poor wear-resistance may also result from the use of the wrong type of tool steel. If a blanking die is made of a 0.60 pct carbon steel of the shock-resisting type, it can't be expected to wear as long as a 1.50 pct carbon steel having a high chromium content.

NEW USE FOR HIGH-SPEED STEEL

An enterprising apprentice in a tool shop stumbled on a small cache of round steel bars the other day. They were just the right size he needed for a small storage rack the foreman had asked him to build. He made a nice job of it. "This ought to make a hit with the foreman," he thought as the last bar was fitted into place.

When the foreman took one look at the rack, he recoiled in horror. "Oh, no!" he groaned. To the puzzled apprentice the foreman growled, "Young fella, that rack you've got there is worth about ten times the cost of the carbon steel bars it's going to hold. Looks like you've used up every piece of my high-speed steel."

Bethlehem ULTRASONIC TESTED **Tool Steel**



Which would you use?

Abrasive wheel, disc or grain—which would you use on any specific metalworking operation? The choice, of course, depends on the material to be removed, desired finish, cost factor and other variables.

Equally important it depends on *improvements in abrasive products and methods* which can make a change to a different type of abrasive advantageous for particular applications.

That's why it pays to standardize on a brand name covering all types of abrasives, from which impartial recommendation of the proper one can be made. Only CARBORUNDUM offers that advantage: a *complete* line of abrasive products from which you can obtain the one best suited to individual job requirements, in every case.

Get the most in production efficiency and economy—by specifying abrasives from the *complete* CARBORUNDUM line.

Only **CARBORUNDUM**
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Meet J.I.C. PNEUMATIC STANDARDS...

(Write for FREE copy of these "Standards")

The four features illustrated above serve to show how Miller Air Cylinders *for years* have been meeting—*even exceeding*—the high quality set by the recently adopted J.I.C. Pneumatic Standards for Industrial Equipment. See for yourself! . . . write for our free bulletin A-105 and receive also your own *free* personal unabridged copy of these "Standards" with standard symbols, sample circuit, interesting point-by-point comparison—all neatly compiled into a handy booklet that fits your reference file and folds to fit your pocket.

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NO COSTLY "DOWNTIME"
NO REPAIRS
NO MAINTENANCE
NO POWER WASTAGE

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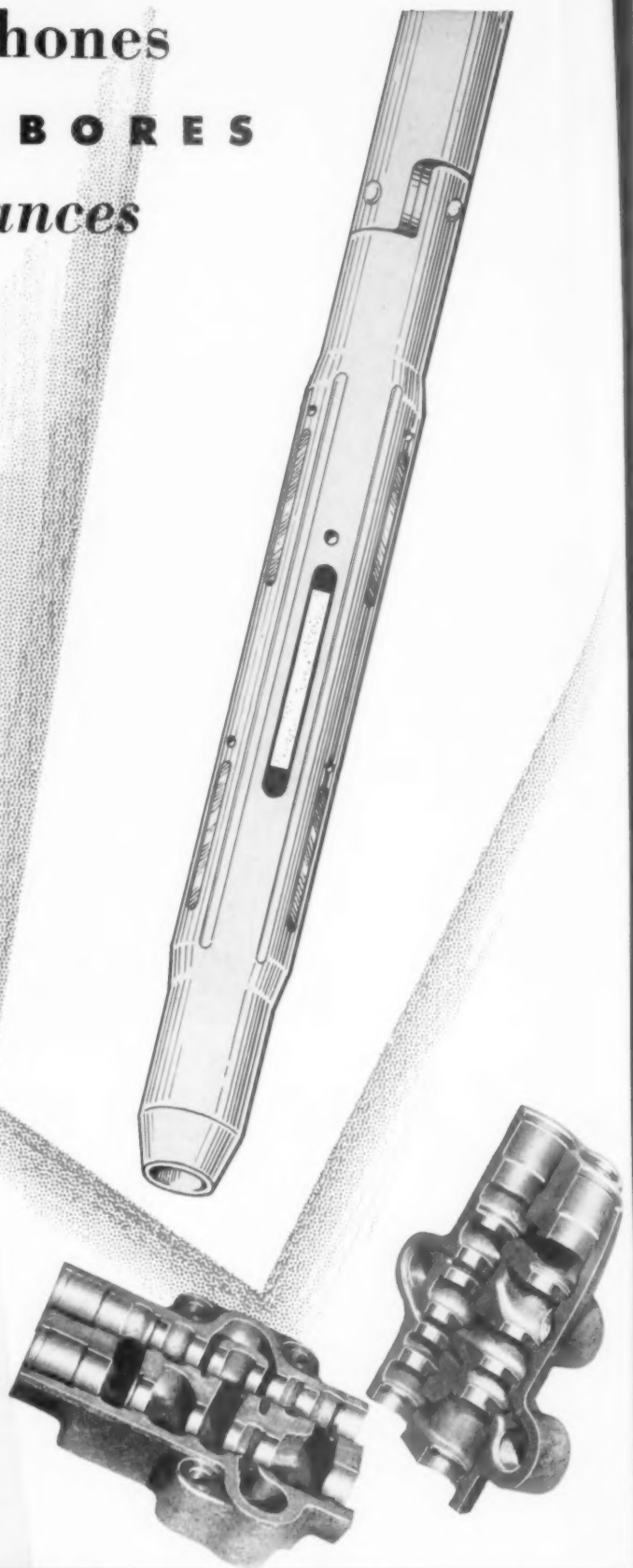
to precise tolerances

Plastic guides stabilize tool as abrasives cross keyways, undercuts, ports, reliefs, or cross holes.

The guides are forced out radially against the surface by the same cone (wedge) that applies pressure to the abrasives. The plastic wears down with the abrasive and keeps the abrasive generating a true cylinder without injurious over-cutting or breaking the edges of the interruptions in the surfaces.

Lands in cast iron hydraulic control panel held to .0002" for size, roundness, straightness and alignment. No lapping or selective fitting of spools is necessary. Holds 750 lbs. pressure without leakage or binding.



Write for issue of Cross Hatch describing MICROHONING of Interrupted Surfaces.

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How to Get Answers to TODAY'S Tap and Drill Problems

IN TOOLING up for new work, changed specifications and the use of substitute materials, you may run into difficult tapping or drilling problems. The simplest way out is to put your questions up to Besly's engineering service. Besly men are in daily contact with all types of production . . . and usually can come up with the *right answer* promptly.

In this way, you can be sure that you will select the most suitable tap or drill for each operation. Besly service-engineers are practical production men. Their experience starts with tool design and covers on-the-job application of the best tap or drill for your work — whether standard or *special*. Besly men can help you to get peak performance and maximum tool life that means *lowest cost per hole.*

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Contains latest data on tap selection and applications and best tapping procedures. Prepared by shop men for shop men. Tap fits and drill sizes are listed in detail. Write today on your letterhead for a copy.

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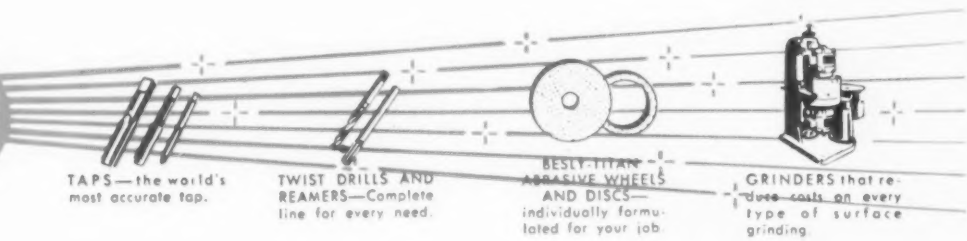

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Free machining in heat-treated condition—air-hardenable to 325 Brinell—much higher when oil quenched. SPEED-CUT's remarkable properties make it your profitable choice for short-run dies, holder blocks, plastic molds and mold plates!

Upon request to our Sales Department, complete information on the composition, heat treatment and use of HOTFORM and SPEED-CUT will be furnished gladly, without obligation.

Vanadium-Alloys

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LATROBE, PA.

COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL CO.

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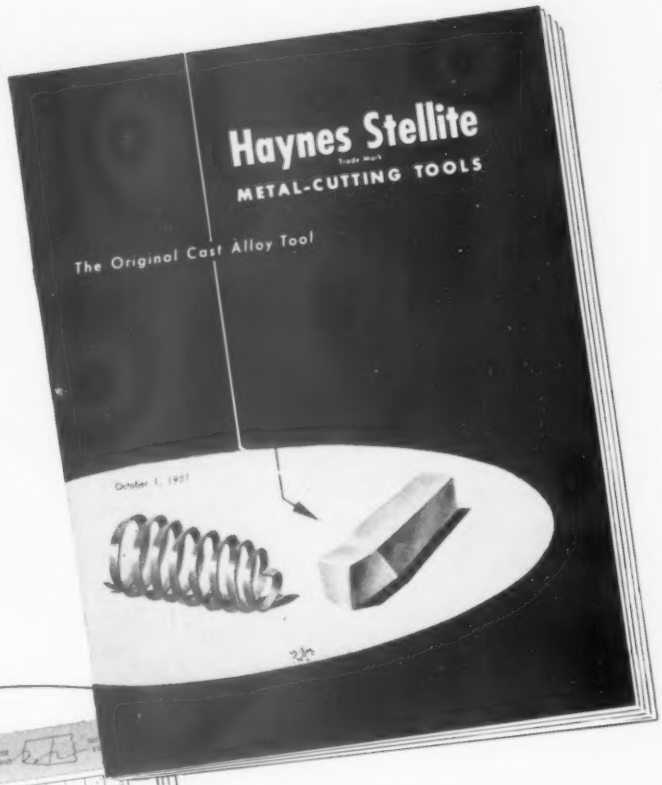
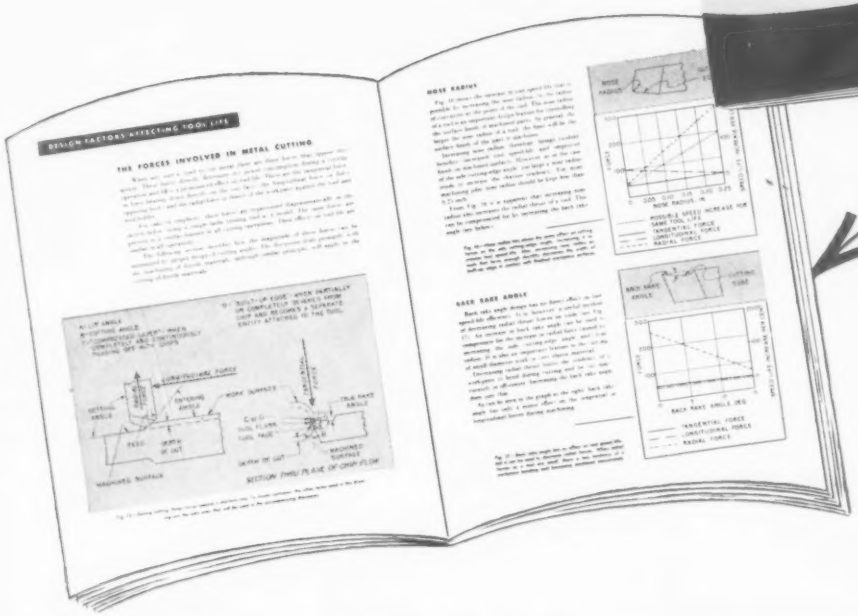
FAST ECONOMICAL MACHINING





44 PAGES
46 ILLUSTRATIONS
28 TABLES

"Haynes Stellite Metal-Cutting Tools" gives up-to-date information on chip formation, tool wear, and the machinability of metals. There is also valuable information on how to increase service life and metal removal rates by proper tool design and tool selection.

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HAYNES Trade-Mark *Alloys*

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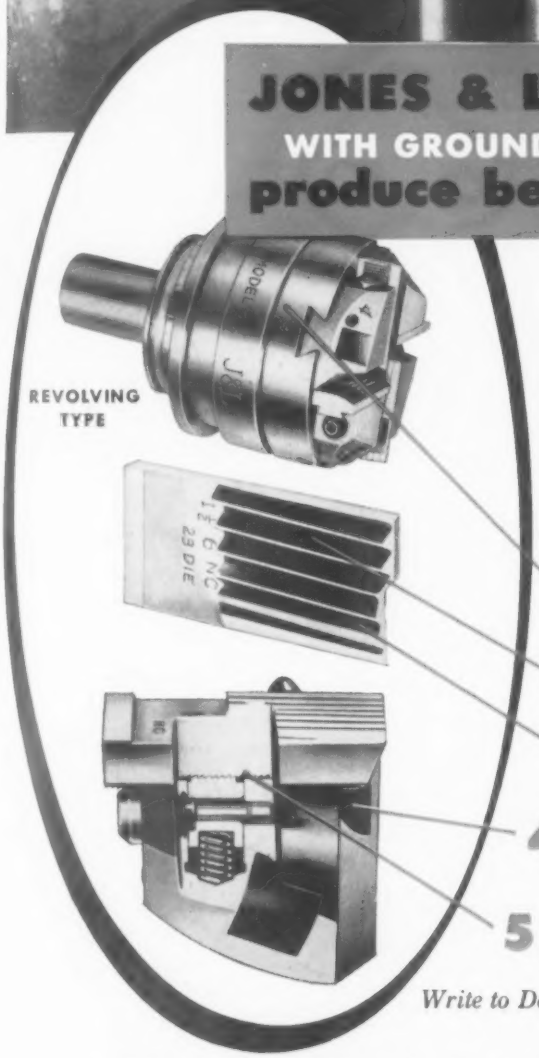
produce better threads at lower cost!



J&L Tangent Chaser Die Heads are rugged, dependable, time-tested tools. They are production engineered to produce better threads at speeds limited only by the material being threaded. Capacities are from #4 to 2".

There is a J&L Tangent Chaser Die Head engineered for your requirement. Stationary types are available for turret lathes or any machine where the tool does not turn. Revolving types are for automatic screw machines, drill presses, threading machines, or any machine where the tool is held in a live spindle.

Among the many features contributing to their ability to perform your threading job faster and better are these:

1. They are hardened and ground throughout. The chaser holding blocks are precision lapped for perfect fit into the dovetail slots in the body. Chaser cutting edges are held to a minimum distance from the die body.
2. Chasers are guaranteed to produce threads to Class #3 fit or better.
3. Exact helix angle is ground into the chasers after hardening. The result is a freer cutting tool—operating with a minimum of friction, heat and wear.
4. With a single set of chaser holders any standard thread within the rated capacity of the holders can be cut, regardless of helix angle. This eliminates the expense and trouble of constantly changing holders for different helix angles.
5. Chasers are changed and set quickly and easily, giving you more production hours each day.

Write to Dept. 710 for catalog.

Thread Tool Division

JONES & LAMSON

MACHINE COMPANY
Springfield, Vermont, U.S.A.

Machine Tool Craftsmen Since 1835

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-151

CUSHMAN

POWER CHUCK EQUIPMENT

Matched units . . . Air cylinders and chucks designed to operate together.

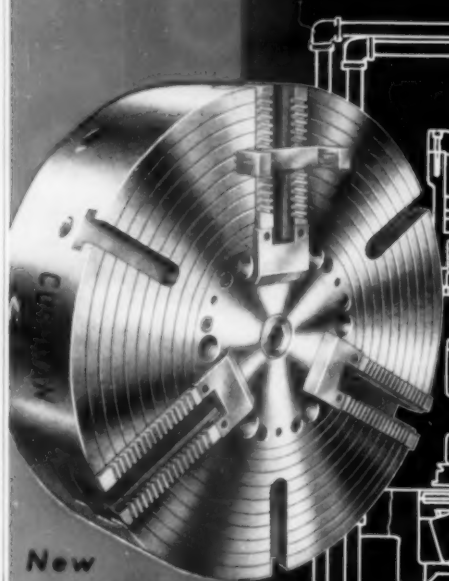
Simple installation adapted to all types of machine tools.

Simple operation . . . nothing "special" for operators to learn. Time-saving, effort-saving centralized control.

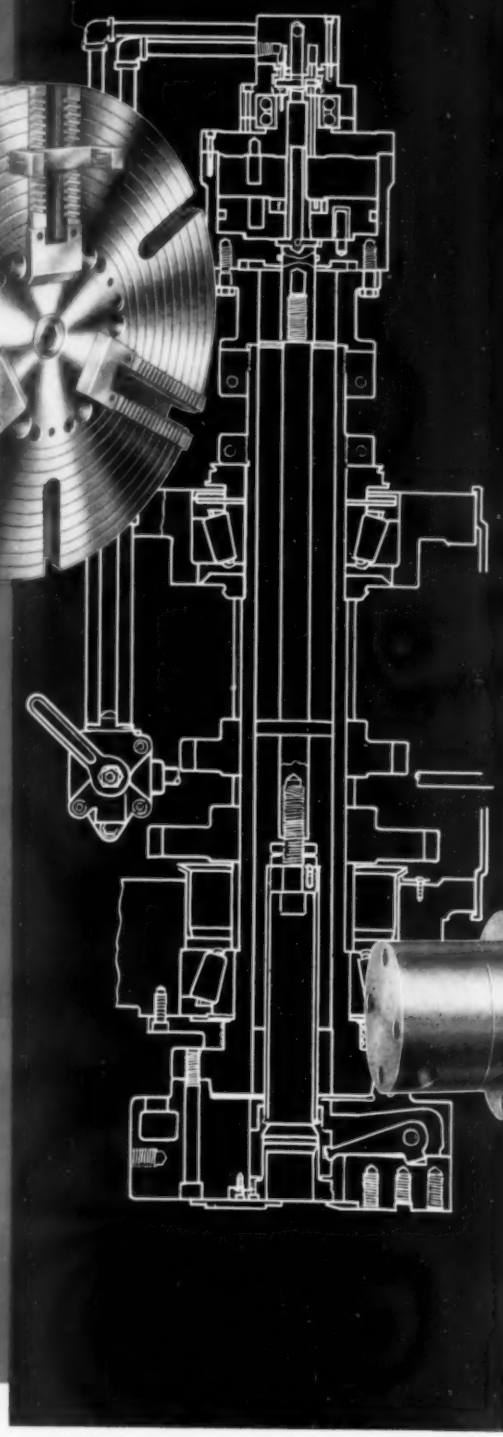
Easy maintenance. Quick unit replacement. Full protection of parts or operating mechanism against chips and coolants. Standard pressure gun lubrication.

A wide range of sizes in the Patented "Accralock" Serrated Adjustable Jaw . . . Manufacturing Type . . . Screw Adjustable Jaw . . . and Wedge Operated Aluminum Body Chucks in 2, 3 and 2-3 jaw styles. Also Round Body and Gib Type 2-Jaw Chucks and Collet Chucks. For American Standard Taper Recess or Straight Recess mounting.

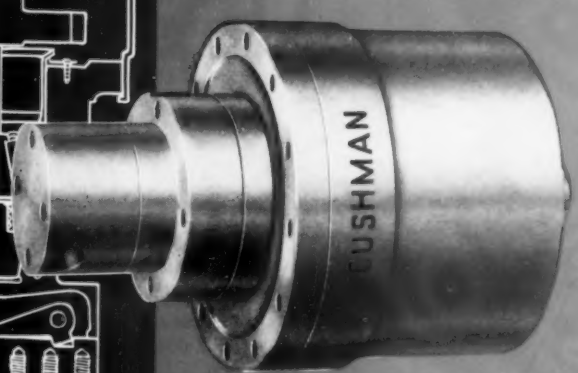
Cushman Rotating Air Cylinders specially designed for use with the above chucks but equally efficient when used with chucks of other makes. Simple, sturdy, trouble-free in operation.



New ACCRALOCK PRECISION CHUCKS



NEW HIGH SPEED AIR CYLINDERS



Write us for a copy of the Cushman Power Chuck Catalog No. PO-64 containing complete data on all lines.

BUY THROUGH YOUR DISTRIBUTOR

THE CUSHMAN CHUCK CO.

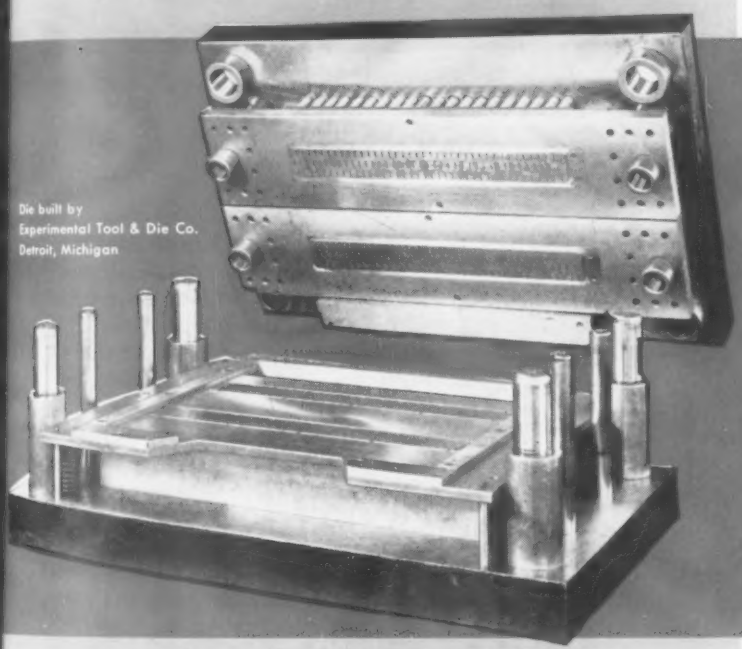
HARTFORD 2, CONN., U. S. A.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-152

PIECE PART REJECTIONS REDUCED

90%

Diemakers at Experimental Tool & Die Company solved a costly repair soldering problem on these stamped radiator heads with the die shown below. Precision was the secret. Die tolerances were held to within .0001" and all die components had to be interchangeable. That's why they specified . . .



Die built by
Experimental Tool & Die Co.
Detroit, Michigan

DANLY®

DIEMAKERS' SUPPLIES and PRECISION DIE SETS

Die Sets | Dowel Pins | Die Springs | Cap Screws | Stripper Bolts

CALL ON THE DANLY BRANCH
CLOSEST TO YOU FOR FAST LOCAL SERVICE

***CHICAGO** 50, 2100 South Laramie Avenue
***CLEVELAND** 14, 1550 East 33rd Street
***DAYTON** 7, 3196 Delphos Avenue
***DETROIT** 16, 1549 Temple Avenue
***GRAND RAPIDS**, 113 Michigan Street N.W.
INDIANAPOLIS 4, 5 West 10th Street
***LONG ISLAND CITY** 1, 47-28 37th Street
***LOS ANGELES** 54, Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2, 111 East Wisconsin Avenue
PHILADELPHIA 44, 18 West Chelten Avenue
***ROCHESTER** 4, 16 Commercial St.

**Indicates complete stock*

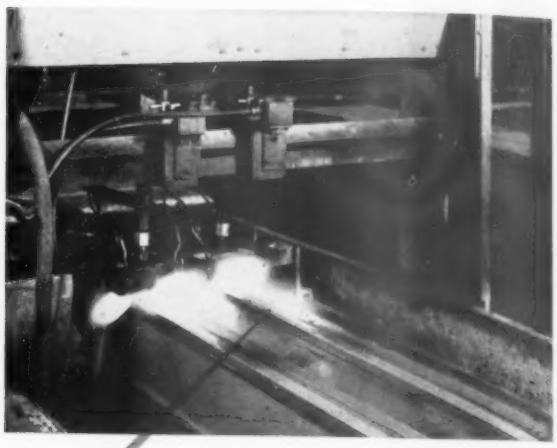
Diemakers everywhere depend on Danly precision. Every Danly product—die sets, dowel pins, die springs, cap screws, stripper bolts—is designed to complement the finest die work. For complete, reliable service, come to Danly!

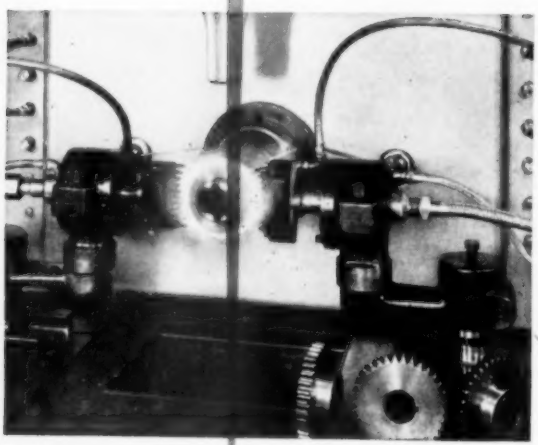
DANLY®

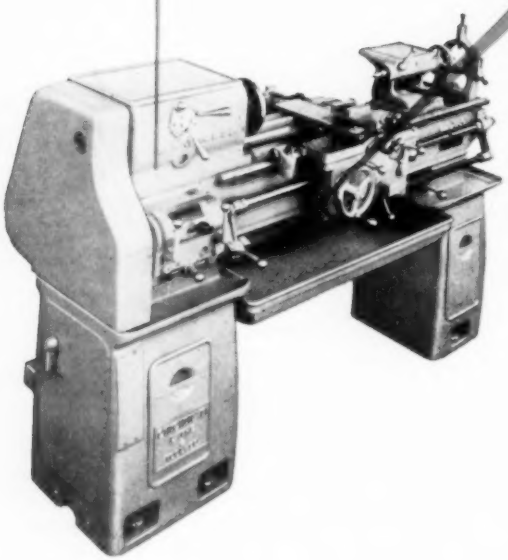
DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue, Chicago 50, Illinois

flame facts







Flame hardened gears throughout are standard . . . **flame hardened bed ways** are available at small extra cost . . . in Tray-Top light duty all geared head engine and toolroom lathes. Add these plus values to **versatility:** 12 spindle speeds, 48 thread and feed changes, top speeds to 1800 rpm., quickest changeover from English to metric thread chasing . . . **operator convenience:** centralized controls, instant speed selection with direct reading color-match speed selector, dual control levers, "Tray-Tops" on headstock and tailstock for parking tools, mikes, gages, etc. . . . **operator safety:** totally enclosed change gear box, totally enclosed electrical panel, accessible only by opening master disconnect switch, feed levers disengaged in down position . . . **floor space savings:** cabinet legs really have room for chucks, face plates, etc., reduce or eliminate need for separate bench or storage space . . . Add up all Tray-Top's outstanding values and you'll find it your best buy. Swing sizes: 10", 12½", 15", 18". Write for new bulletin.

OF OUTSTANDING VALUE

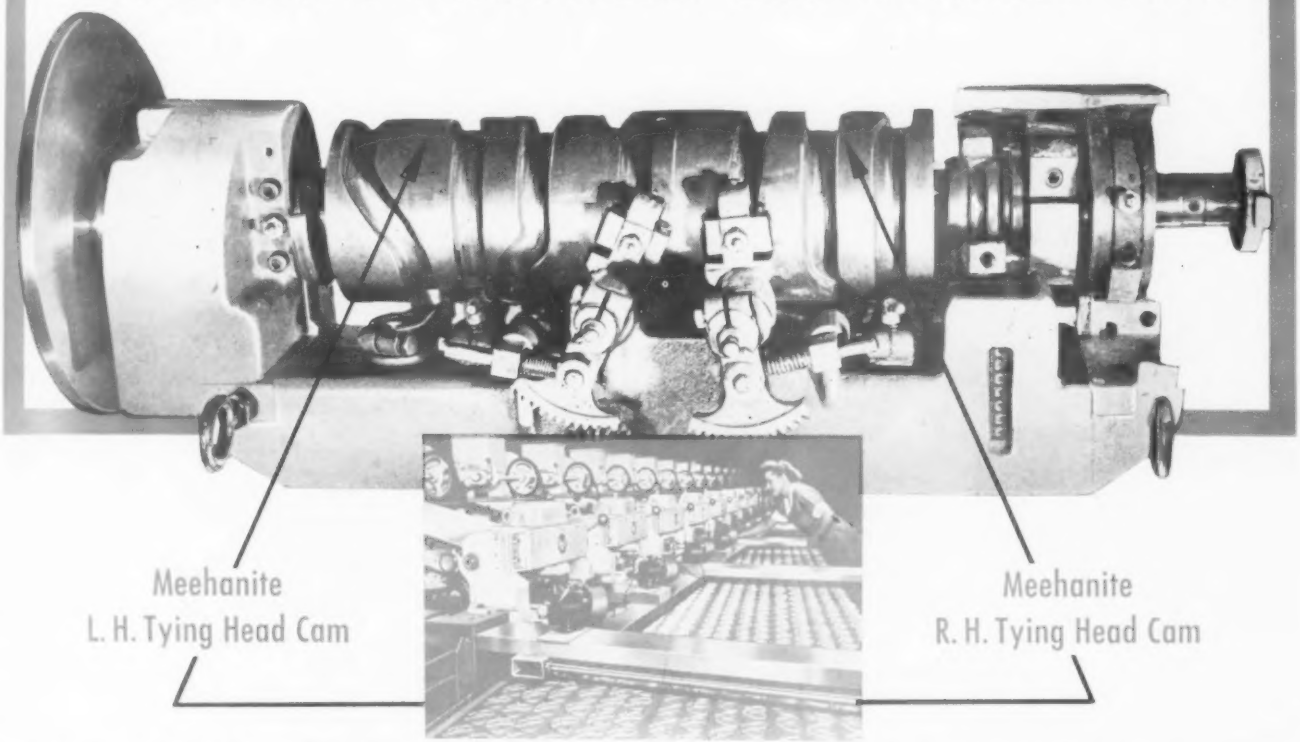
CINCINNATI 9, OHIO, U.S.A.

cincinnati lathe & tool co.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-154

The Wear Resistance of MEEHANITE Metal offers

PROLONGED ACCURACY and SERVICE LIFE



The accuracy of the mechanism of a machine reproducing the tying motions of human hands and fingers in the manufacture of pretzels is dependent in many ways upon the Meehanite cam illustrated. Manufactured by the American Machine & Foundry Company, New York, N. Y., the machine contains many unique design features built around the dependability and steady accurate performance of many parts governed by the Meehanite cam. The cam is built up from two Meehanite castings into which seven individual cam tracks are machined.

Freedom from after-machining distortion, plus the wear resistance and machinability of the Meehanite castings are important contributions to the equipment.

The better properties of Meehanite castings are achieved through established and scientific production controls and these extras in characteristics and quality can help improve your product and manufacturing efficiency.

WHEN YOU NEED "EXTRAS" IN QUALITY OR PROPERTIES CONSULT ANY OF THE FOUNDRIES LISTED BELOW

American Brake Shoe Co.	Mahwah, New Jersey
The American Laundry Machinery Co.	Rochester, New York
Atlas Foundry Co.	Detroit, Michigan
Banner Iron Works	St. Louis, Missouri
Barnett Foundry & Machine Co.	Irvington, New Jersey
E. W. Bliss Co.	Hastings, Mich. and Canton, O.
Builders Iron Foundry	Providence, Rhode Island
Continental Gin Co.	Birmingham, Alabama
Crawford & Doherty Foundry Co.	Portland, Oregon
The Cooper-Bessemer Corp.	Mt. Vernon, Ohio and Grove City, Pa.
Empire Pattern & Foundry Co.	Tulsa, Oklahoma
Farrel-Birmingham Co. Inc.	Ansonia, Connecticut
Florence Pipe Foundry & Machine Co.	Florence, New Jersey
Fulton Foundry & Machine Co., Inc.	Cleveland, Ohio
General Foundry & Manufacturing Co.	Flint, Michigan
Greenlee Foundry Co.	Chicago, Illinois
The Hamilton Foundry & Machine Co.	Hamilton, Ohio
Hardinge Company, Inc.	New York, N. Y.
Hardinge Manufacturing Co.	York, Pa.
Johnstone Foundries, Inc.	Grove City, Pennsylvania
Kanawha Manufacturing Co.	Charleston, West Virginia
Lincoln Foundry Corp.	Los Angeles, California
E. Long Ltd.	Orillia, Ontario
Otis Elevator Co., Ltd.	Hamilton, Ontario
The Henry Perkins Co.	Bridgewater, Massachusetts
Pohlman Foundry Co., Inc.	Buffalo, New York
Rosedale Foundry & Machine Co.	Pittsburgh, Pennsylvania
Ross-Meehan Foundries	Chattanooga, Tennessee
Shenango-Penn Mold Co.	Dover, Ohio
Standard Foundry Co.	Worcester, Massachusetts
The Stearns-Roger Manufacturing Co.	Denver, Colorado
Traylor Engineering & Mfg. Co.	Allentown, Pennsylvania
Valley Iron Works Inc.	St. Paul, Minnesota
Vulcan Foundry Co.	Oakland, California
Warren Foundry & Pipe Corporation	Phillipsburg, New Jersey

"This advertisement sponsored by foundries listed above."

MEEHANITE®

NEW ROCHELLE, N. Y.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-155

PARKER · MAJESTIC PM **PRECISION MACHINES**

Above is pictured the home and products of the

PARKER-MAJESTIC, INC.

For over twenty-one years this company has manufactured the Parker Spindles used in Precision Grinding, Boring and Milling applications.

Supplementary products include the well known line of Parker-Majestic Internal, External, No. 2 Surface and Rotary Surface Grinders.

Descriptive literature upon request.

PARKER-MAJESTIC, INC.

formerly **MAJESTIC TOOL & MFG. CO.**

147 JOS. CAMPAU • DETROIT 7, MICHIGAN

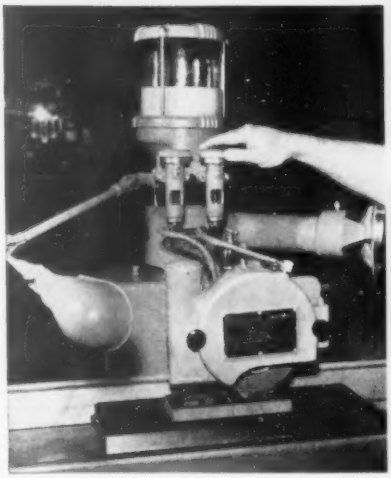
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-156

DoALL "COOL GRINDING"

U. S. Patent No. 2470350

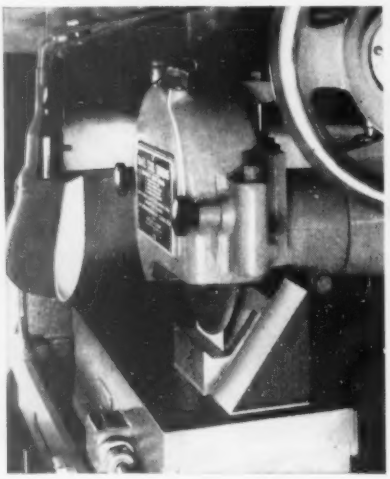
COOLS THE CUT AND THE WORK
NO BURNING OR CHECKING
FASTER GRINDING
GREATER ACCURACY
LONGER WHEEL LIFE
FULL VISIBILITY
NO SPLASH GUARDS
NO MESSY TANK OR PUMPS

There is a DoALL Precision Grinder for every surface grinding requirement.



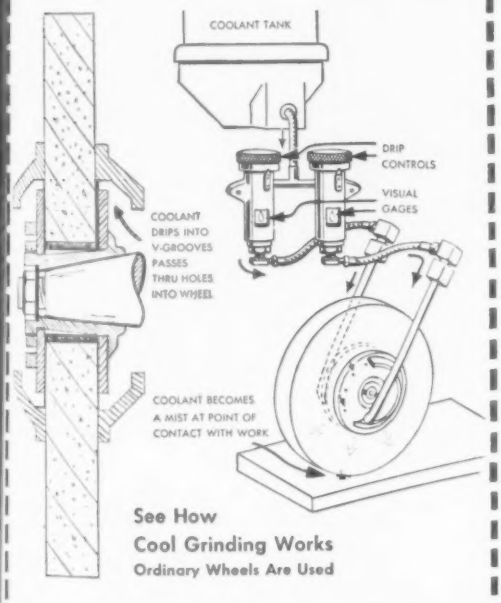
The coolant is metered to flow into and through the wheel.

Grinding piercing dies—a tough job done faster, better by "COOL GRINDING."



Full visibility of wheel and work —a big benefit in form grinding.

HOW IT WORKS



See How
Cool Grinding Works
Ordinary Wheels Are Used

IN DoALL "COOL GRINDING" coolant flows *through* the wheel and atomizes at the point of work. Every cutting particle is surrounded by coolant. *Standard wheels are used.* The results are spectacular. Big time and labor savings, greater precision, longer life between tool grinds are just a few of the benefits. There is a complete line of DoALL Precision Grinders with "COOL GRINDING" for every toolroom and production job. Ask to have a DEMONSTRATION of one of these grinders in your own plant.

THE DoALL COMPANY, 254 N. Laurel Ave., Des Plaines, Ill.

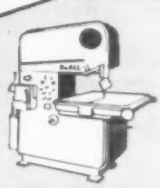
SEND FOR CATALOG

Tells all about the benefits of "COOL GRINDING," shows DoALL Precision Grinders for every requirement.

DoALL

27 SALES-SERVICE STORES

CALL DoALL FOR:



Machine Tools

Gaging Equipment

Tool Steel . . .

Band Tools . . .

Metal Working Supplies

YOU GET PROMPT DELIVERY plus* . . .

WHEN YOU SPECIFY O-M CYLINDERS

*MORE POWER IN LESS SPACE AT LOW COST

—as provided by these talked-about features:

Compact Performance

Simplified design eliminates tie-rods and bulky end caps. Saves up to 1/3 space when installed.

Flexible Performance

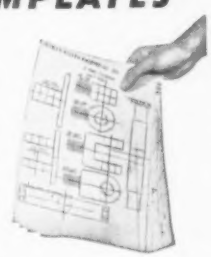
Interchangeable mounting brackets may be fitted without disassembly. Pipe Ports adjustable to any angle. Easily disassembled and re-packed.

Low Cost Performance

Lower first cost . . . smaller inventory . . . minimum maintenance.

FREE TEMPLATES

For the first time in the industry, O-M offers a complete set of templates showing all cylinders and mounting brackets. ½ scale. Your set on request.



O-M manufactures:

- **Air**
- **Water**
- **Hydraulic**

Cylinders

In full range of sizes from 1½ to 8" bores. All machined steel and bearing bronze.

ORTMAN-MILLER
MACHINE COMPANY, INC.

1216 150th Street, Hammond, Indiana

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-161

Automatic Recessing

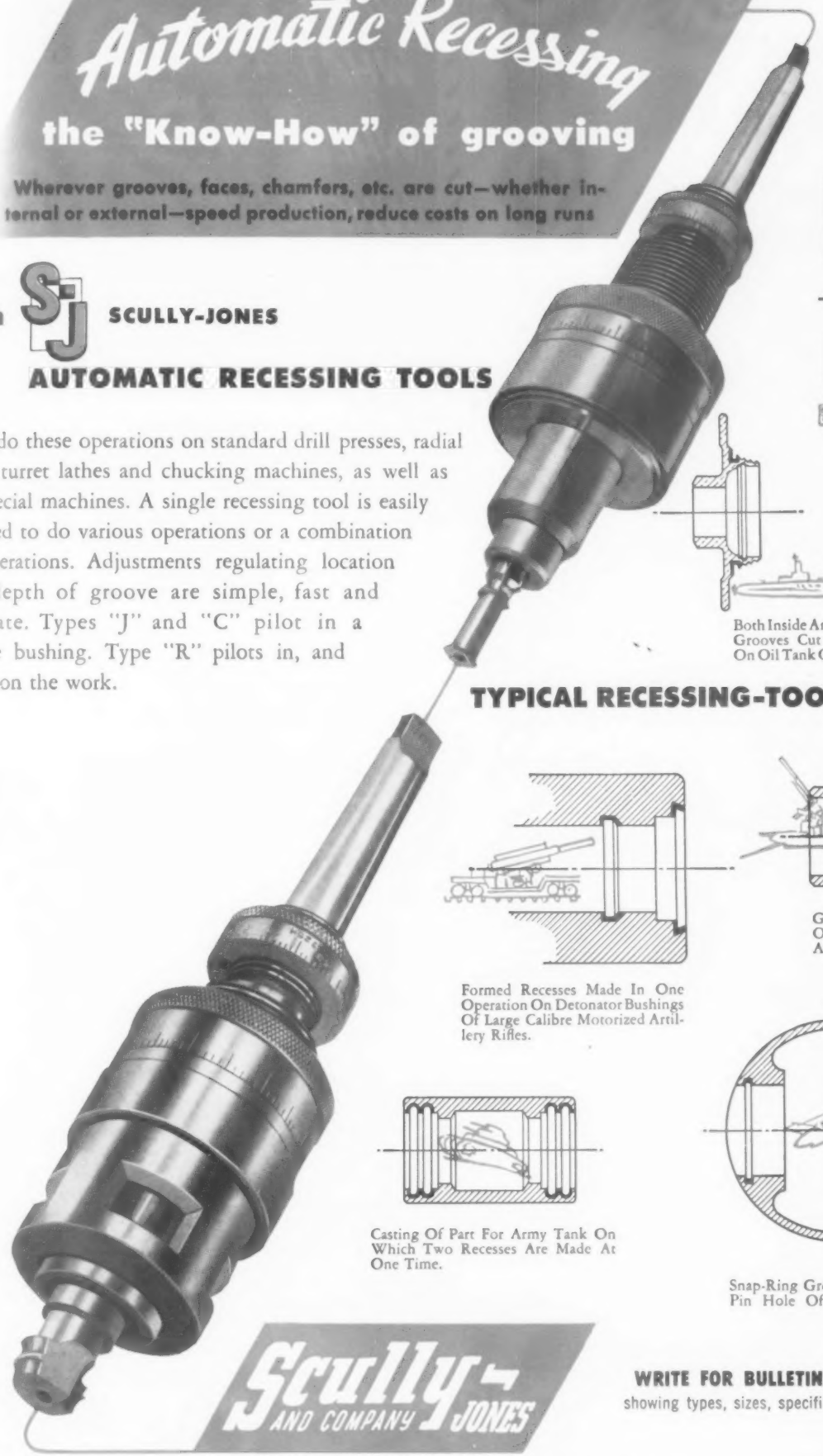
the "Know-How" of grooving

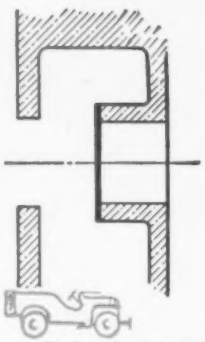
Wherever grooves, faces, chamfers, etc. are cut—whether internal or external—speed production, reduce costs on long runs

with S-J SCULLY-JONES

AUTOMATIC RECESSING TOOLS

They do these operations on standard drill presses, radial drills, turret lathes and chucking machines, as well as on special machines. A single recessing tool is easily adapted to do various operations or a combination of operations. Adjustments regulating location and depth of groove are simple, fast and accurate. Types "J" and "C" pilot in a fixture bushing. Type "R" pilots in, and stops on the work.



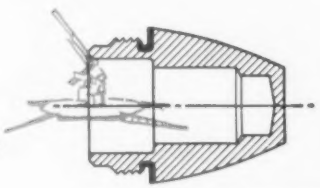


Facing An Internal Boss On Motor Castings Where Obstruction Usually Causes Difficulty.

Both Inside And Outside Clearance Grooves Cut In One Operation On Oil Tank Caps For Submarines.

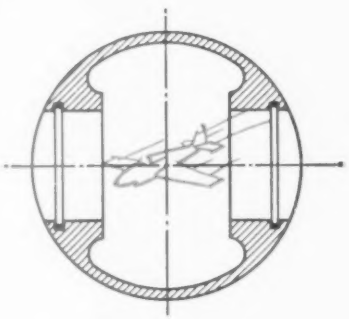
TYPICAL RECESSING-TOOL OPERATIONS

Formed Recesses Made In One Operation On Detonator Bushings Of Large Calibre Motorized Artillery Rifles.



Groove For Thread Clearance Cut On Anti-Aircraft Projectile With Automatic "Necking" Tool.

Casting Of Part For Army Tank On Which Two Recesses Are Made At One Time.



Snap-Ring Grooves Cut In Wrist Pin Hole Of Airplane Pistons.

Scully-Jones AND COMPANY

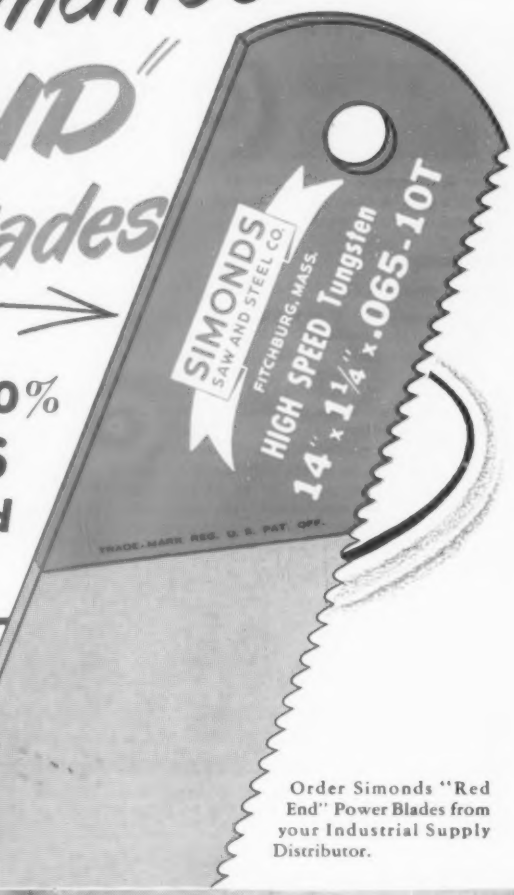
1915 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

WRITE FOR BULLETIN No. 10-50
showing types, sizes, specifications and prices.

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-163

For 100% Performance get "RED END" Power Hack-Saw Blades



. . . they're 100% SIMONDS Quality-Controlled

Cut-ability . . . that's the word for "Red End" Power Blades! *Cut-ability* that starts with special Simonds hack-saw steel, double checked for toughness and grain structure. *Cut-ability* that proves out *and pays off* on the job with straight fast cuts and *more cuts* per blade. Supplied in all standard sizes with a choice of these two types of steel:

High Speed Molybdenum for cutting mild alloys and general work where breakage-resistance and long life are musts.

High Speed Tungsten for top cutting efficiency on toughest alloy steels where abrasion-resistance is vital.

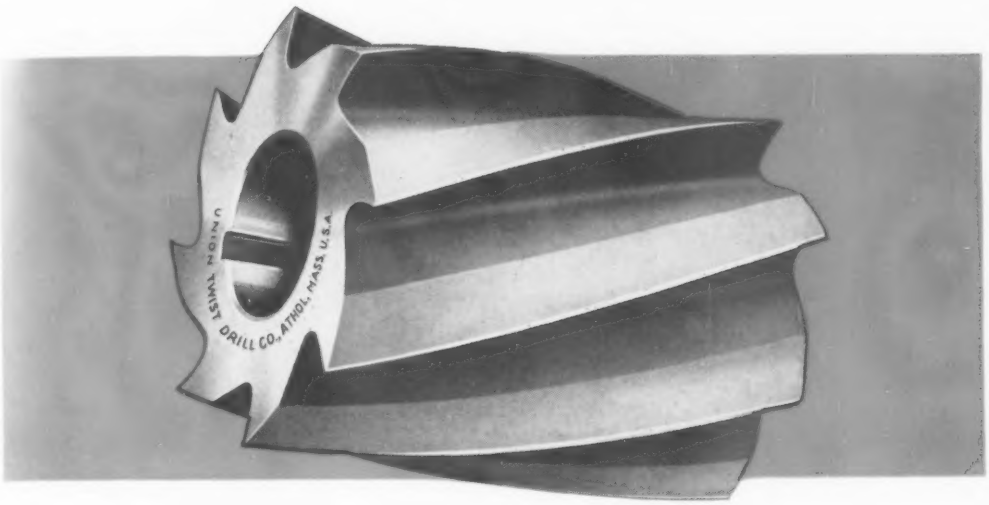
Order Simonds "Red End" Power Blades from your Industrial Supply Distributor.

SIMONDS SAW AND STEEL CO.
FITCHBURG, MASS.

Branch Offices in Boston, Chicago, San Francisco, and Portland, Ore. Canadian Factory in Montreal, Que.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-165

You cut downtime, increase output with UNION *Profile Cutters*



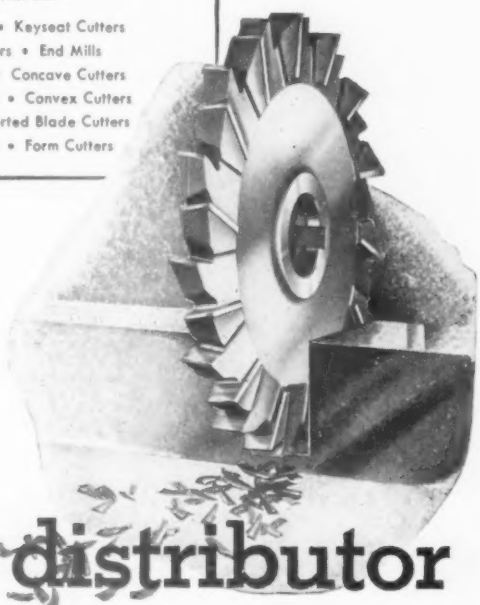
You can depend on a *minimum* downtime for reconditioning when you use Union high speed steel heavy duty profile cutters. Their undercut teeth have a special spiral angle that assures unusual efficiency and permits resharpening without rapid increase in width of land. Note the wide spacing, too. It allows ample chip room, and makes possible exceptionally strong teeth. Because there are fewer teeth in contact with the work, you also save on power.

Union profile cutters are performance proved. Rely on them for the toughest jobs in the shop. They work to closest tolerances, produce outstanding results from old or new machines. Available in 12 sizes ranging from 2½" to 4½" diameter.

A MILLING CUTTER FOR EVERY JOB

Whether you need special cutters built to your specifications or can use the standard Union cutters, there's a Union milling cutter to meet your needs. Following is a partial list —

Plain Milling Cutters • Keyseat Cutters
Helical Milling Cutters • End Mills
Metal Slitting Saws • Concave Cutters
Screw Slotting Cutters • Convex Cutters
Slitting Shears • Inserted Blade Cutters
Side Milling Cutters • Form Cutters



no other profile cutter will outperform a UNION

contact your local distributor

His name is listed in Union's THOMAS' REGISTER insert under "Drills, Twist".

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

Milling Cutters  Gear Cutters  Twist Drills  Hobs 

Reamers  Carbide Tools 

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass. Taps, Dies, Screw Plates . . . BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers . . . BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-167

NEW

HEAVY DUTY DIAL FEED

22" Diameter Table Top

4, 6, 9, 12, 18 or 36 positions

★

Positions up to 1000 lbs. quickly and accurately

★

Positive locking

★

Can be mounted in any position

LIGHT DUTY DIAL FEED

Model BRET-10C has a 10" diameter table top. Will position loads up to 500 lbs. Adjustable to position 4, 6, 8, 12 or 24 stations.

Bellows Model BRET-22 Rotary Feed Table is an electrically controlled, air-powered unit for dial feeding work pieces to drilling machines, tappers, reamers, press rams, etc.

Powered by a 3⅝" bore Bellows Air Motor, the standard 22" diameter table top will position loads of 1000 lbs., quickly and accurately.

At each station the table top comes to a stop gently, without abrupt impact, and is locked into position by a 1¼" bore air cylinder. Model BRET-22 is easily synchronized electrically to other machine operations.

The 22" diameter mild steel table top is easily removed for mounting jigs, fixtures, or oversize table top. Standard models can be set to position 4, 6, 9, 12, 18 or 36 positions.

Write for Bulletin T-85 Today! Address: The Bellows Co., Dept. TE-1151, Akron 9, Ohio

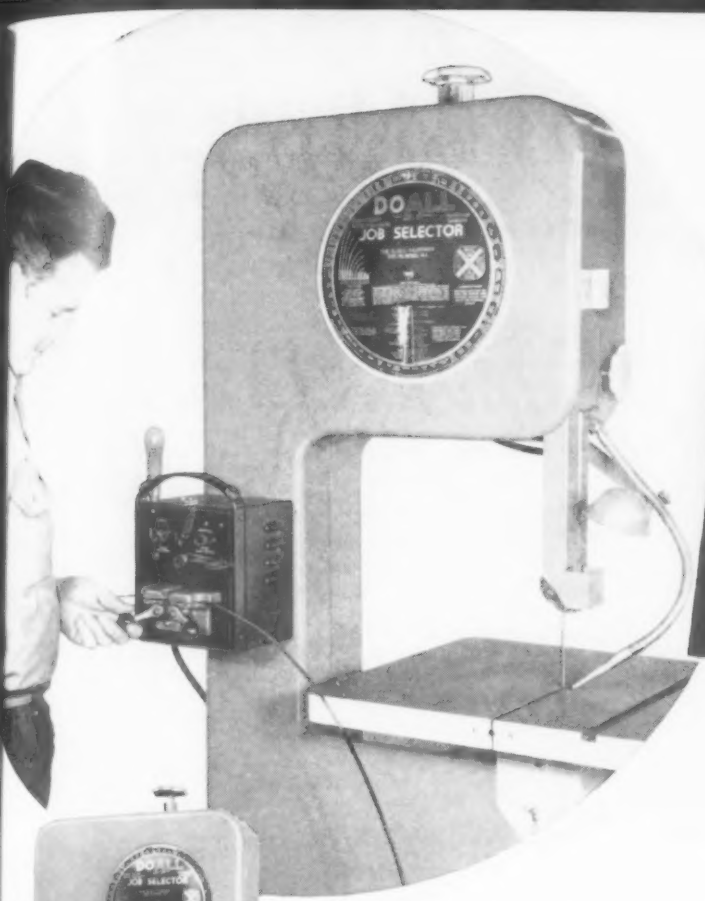
The Bellows Co.

AKRON 9, OHIO

1305

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-168

BIGGEST BARGAIN AVAILABLE in a BAND-TOOLED MACHINE



ONLY $750.00 For the "UTILITY" DoALL

DOUBLE RANGE • VARIABLE SPEED • 16" COMBINATION
Band Sawing, Filing and Polishing Machine with Welder—Priced Lower Than Anything Comparable

SMALL shops, large shops, don't pass this up. Here is $750.00 worth of versatile band machine that does full scale, precision band sawing and filing for the majority of small shop jobs or experimental and model work for large shops. The DoALL Utility band machine gives you a full 16" throat with *variable speed in two ranges* from 50 to 350 and 860 to 5200 F.P.M. The machine pays for itself in short order because its wide range of application lets you save valuable manhours — frees larger machines for heavier more profitable work.

The versatile DoALL Utility model cuts any shape faster and cleaner. Cut or make dies, punches, stampings, templates, various machine parts, models, tools, jigs or fixtures quickly and easily.

For external or internal filing it takes only a moment to change over the Utility. Filing on a DoALL is 9 times faster than hand filing, 4 times faster than by jig.

DoALL also offers you the greatest selection of saw bands and band files for any job, any band machine. They are readily available for immediate delivery from local stock.

See the DoALL Utility band machine operate in your plant. Ask for a FREE DEMONSTRATION. Call your local DoALL store or write :

THE DoALL COMPANY
254 N. Laurel Ave., Des Plaines, Ill.

NEW, LONGER-LIVED DoALL SAW BANDS AVAILABLE FROM LOCAL STOCK!

Increased production makes all sizes, all types of DoALL Saw Bands available for immediate delivery from local stock. All are packaged in the exclusive DoALL "strip out" container for safety, convenience and blade protection. There is a DoALL Saw Band for every job.

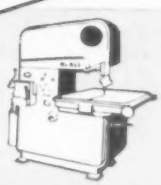
Send for Free Bulletin

Learn about jobs that DoALL Band Machining can do for you. Find out how to cut any shape, any material faster, better, more economically.

B-5

INDUSTRY'S NEW TOOLS — **DoALL** — 33 SALES-SERVICE STORES

CALL DoALL FOR:





Machine Tools . . . Gaging Equipment . . . Tool Steel . . . Band Tools . . . Metal Working Supplie

Index of The Tool Engineer Advertisers

NOVEMBER, 1951

The Index to Advertisers is published as a reader service. Although every precaution is taken to assure correct listing, no allowance will be made for error or omission.

*Exhibitor in 1952 ASTE Industrial Exposition.

†User of ASTE Data Sheets.

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400 Madison Ave.
Phone: Plaza 9-4018
New York 17, New York

OHIO
Richard E. Cleary
Commercial Bank Building
Phone: Berea 4-7719
Berea, Ohio

CENTRAL
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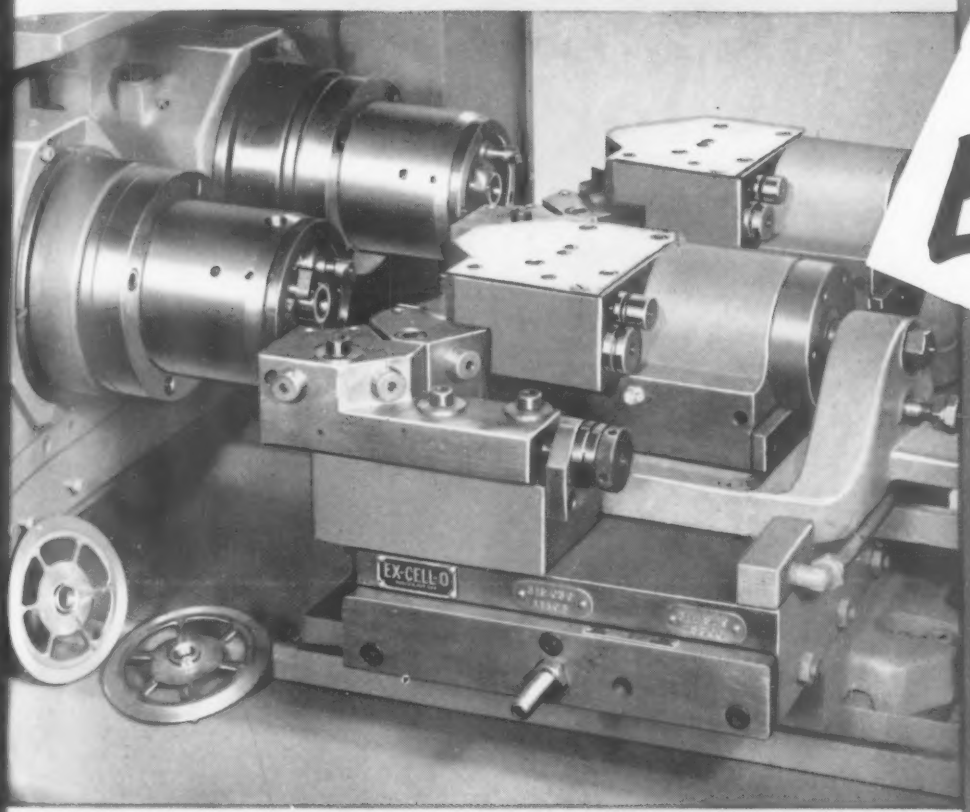
10700 Puritan Avenue
Phone: University 4-7300
Detroit 21, Michigan

WESTERN
Stanley F. Girard
540 N. Michigan Ave.
Phone: Michigan 2-4465
Chicago 11, Illinois

PACIFIC COAST
W. R. McIntyre
423 First Trust Bldg.
Phone: Ryan 1-6981
Pasadena 1, California

8 Surfaces Finished In One Cycle . . .

PRECISION MACHINING the EX-CELL-O WAY



LEFT: Ex-Cell-O 2112-A Precision Boring Machine equipped for finishing eight surfaces of die cast aluminum parts. Work pieces in left foreground.

Sectional view of work showing operations in heavy lines.

Flexibility, economy, and high production are all yours with Ex-Cell-O 2112-A Precision Boring Machines. Shown here is a typical use that may suggest a money-saving method for your shop.

Ex-Cell-O engineers designed chucks that clamp die cast aluminum parts by the fins to solve two problems: (1) clamping frail parts without distortion; (2) boring the I.D. and turning the O.D. in one machine cycle.

The operations, performed on two parts simultaneously, include boring inside diameter; chamfering outer edge of bore; turning outside diameter and pilot diameter; facing the small hub and area between outside diameter and pilot diameter; and chamfering outer edges. Net production is 102 per hour.

It may be that a versatile Ex-Cell-O machine of this type is the answer to your machining problem. For full information and specifications, contact your local Ex-Cell-O representative, or write Ex-Cell-O in Detroit today.

Ex-Cell-O Style 2112-A Precision Boring Machine.

XLO

EX-CELL-O CORPORATION DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
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51-6

WHAT THE EVOLUTION OF WALES HOLE PUNCHING & NOTCHING EQUIPMENT *means to YOU!*

● The evolution of this equipment not only provides the most complete line of STANDARD hole punching and notching equipment in America, but has revolutionized tooling practice by *astoundingly reducing tooling costs and time.*

Before the availability of Wales Equipment, it was necessary to design and custom-build a completely new "fixed" die for each pattern with special punches and punch plates, special stripper plates, special die buttons and die plates. NOW . . . a group of Wales independent, self-contained Units may be set up in unlimited patterns and put into operation the same day a pattern is released for production. Setting up Wales Equipment is a simple assembly operation. *No aligning of punches and dies.*

After a pattern has been run, the same group of Wales Units may be used and reused in other patterns on stamping presses and press brakes eliminating "dead storage" of set-ups and tooling investments by keeping them in practically continuous operation.

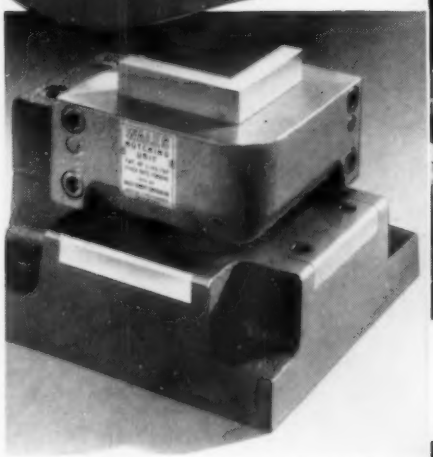
There's always something new in the Wales Line,—so write TODAY for your copies of fully-illustrated, functionally-colored Wales Catalogs.

WALES-STRIPPIT CORPORATION
GEORGE F. WALES, *Chairman*
393 PAYNE AVE., NORTH TONAWANDA, N. Y.
(*Between Buffalo and Niagara Falls*)
WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO
Specialists in Punching and Notching Equipment

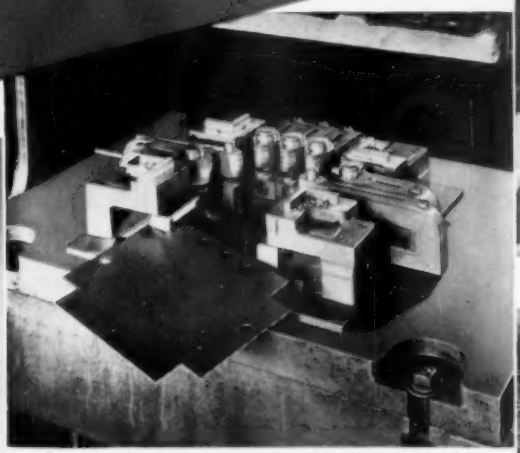
1 "Strippits" the original Wales product revolutionized die by standardizing ping pressures.

2 By incorporating the basic design of "Strippits", independent, self-contained Wales Type "BL" Hole Punching Units became a reality.

5 Wales Type "CD" Hole Punching Units in operation in stamping press for punching mild steel up to ⅛" thick.



Wales Notching Units were a natural outgrowth of the successful applications of Wales Hole Punching Equipment and basic principle of Wales "Strippits"

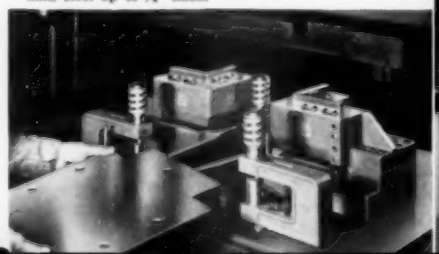


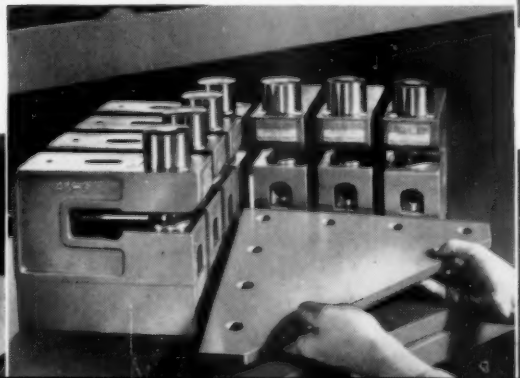
4 Above is a combination set-up of Wales Type "BL" Hole Punching Units and Type "N" Notching Units for punching mild steel up to ⅛" thick. Note the punched and notched work in foreground.

8 Wales Type "E" Hole Punching Units for punching angles, channels and extrusions up to ½" thick. Showing 3 press brakes in line punching holes in stringers up to 40 feet long.

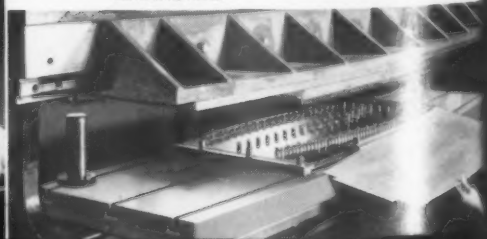
9 Wales Multiple Hole Punching System for simple, fast, convenient and economical punching sheet metal parts up to thick mild steel.

A combination set-up of Wales Type "NJ" Notching and Type "CJ" Hole Punching Units punching and notching mild steel up to ¼" thick.





7 Wales Type "G" Hole Punching Units for punching mild steel up to ½" thick.



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